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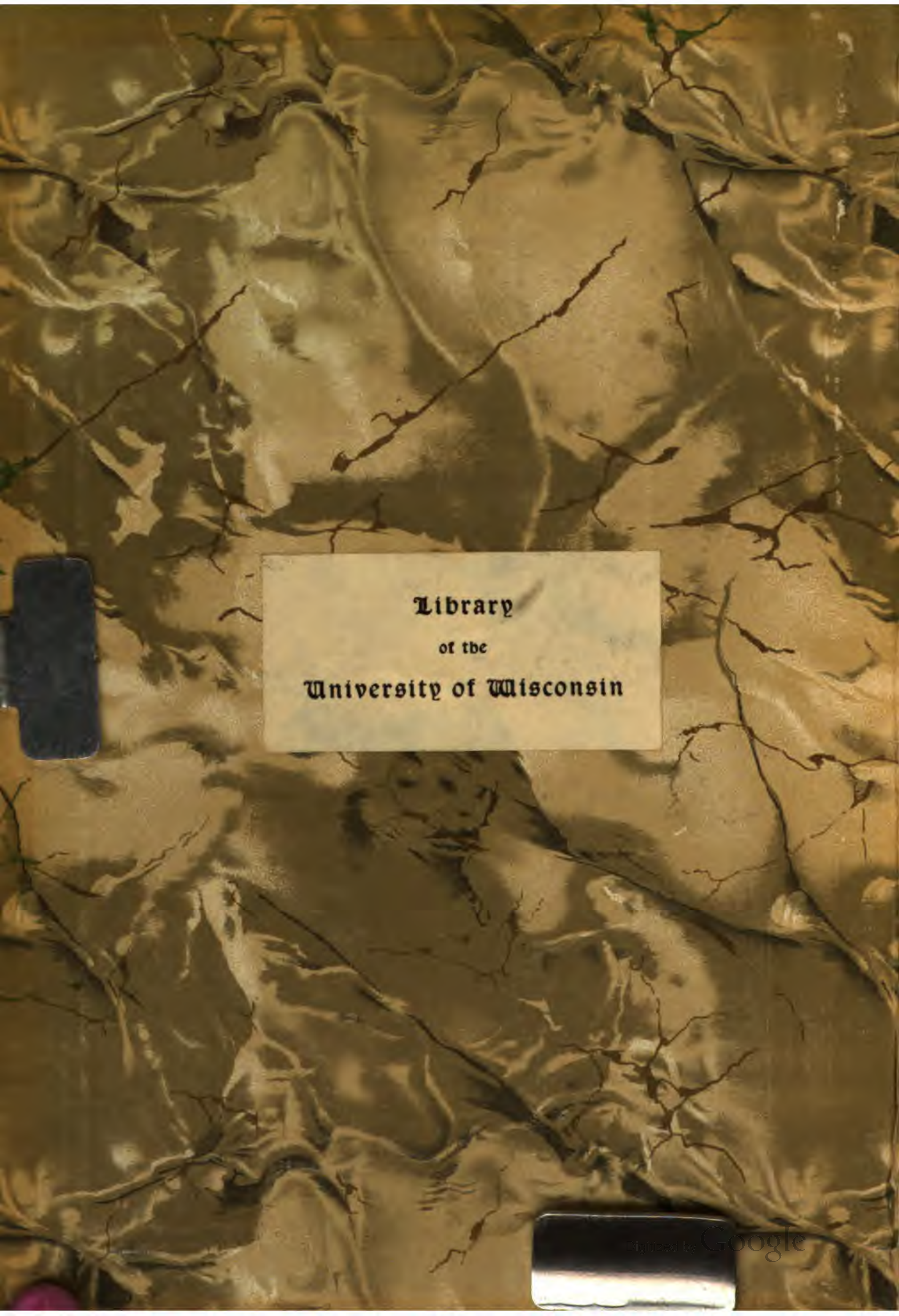

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KEY TO PRONUNCIATION.

ä	far, father
ā	fate, hate
a or ă	at, fat
ã	air, care
ạ	ado, sofa
â	all, fall
ch	choose, church
ē	eel, we
e or ĕ	bed, end
ė	her, over: also Fr. *e*, as in *de; eu,* as in *neuf;* and *oeu,* as in *boeuf, coeur;* Ger. *ö* (or *oe*), as in *ökonomie.*
ẹ	befall, elope
ē	agent, trident
ff	off, trough
g	gas, get
gw	anguish, guava
h	hat, hot
h or ʜ	Ger. *ch,* as in *nicht, wacht*
hw	what
ī	file, ice
i or ĭ	him, it
î	between e and i, mostly in Oriental final syllables, as, Ferid-ud-din
j	gem, genius
kw	quaint, quite
ṅ	Fr. nasal *m* or *n,* as in *embonpoint, Jean, temps*
ñ	Span. *ñ,* as in *cañon* (căn′yŏn), *piñon* (pēn′yŏn)
ng	mingle, singing
nk	bank, ink
ō	no, open
o or ŏ	not, on
ô	corn, nor
ȯ	atom, symbol
ọ	book, look
oi	oil, soil; also Ger. *eu,* as in *beutel*
ō or oo	fool, rule
ou or ow	allow, bowsprit
s	satisfy, sauce
sh	show, sure
th	thick, thin
ŧh	father, thither
ū	mute, use
u or ŭ	but, us
u̇	pull, put
ü	between u and e, as in Fr. *sur,* Ger. *Müller*
v	of, very
y	(consonantal) yes, young
z	pleasant, rose
zh	azure, pleasure
′(prime), ″	(secondary) accents, to indicate syllabic stress

THE ENCYCLOPEDIA AMERICANA

O

ORLEY, ôr'lĭ, **Bernaert** (Barend, Bernhard) **van,** Dutch painter: b. Brussels, about 1493; d. there, 6 Jan. 1542. He studied in Italy between 1509 and 1515 and imitated the Italian masters, especially Raphael. Returning to Brussels he was appointed court painter to Margaret of Parma (1515) and to her successor Maria of Hungary (1520). While he began his career as a follower of Gerard, David, he altered it after his Italian travels, but in his modeling and color scheme he never forsook the traditions of the Dutch school. His works indicate keen power of observation and a delicate perception of beauty in form and expression. Among the best of them are 'Scenes from the Life of Saint Thomas and Saint Matthew' (altarpiece), in the Imperial Museum, Berlin; 'Sorrows of Job' (triptych) in the Brussels Museum; 'The Flight into Egypt' (in the Liverpool Royal Institution); 'Worship of the Holy Trinity' (Lübeck, Saint Mary's Church), and 'The Holy Family' (in the Dresden Gallery). He also furnished designs for wall hangings which were executed in Brussels tapestry, of which there is an example in the Louvre, 'The Imperial Hunt,' executed for the Emperor Charles V.

ORLOFF, ôr-lŏf', a Russian noble family, founded 1689 by Ivan, who was condemned to death by Peter the Great, but pardoned for his bravery and coolness. His grandson Grigori (1734–83), fought in the Seven Years' War, became the paramour of Catherine II, to whom he gave the famous Orloff diamond, or Koh-i-Nur, weighing 193 carats, and now a crown jewel. But she dismissed him for Potemkin. His brother Alexei (1737–1808) plotted against Peter III, and in 1770 won the battle of Tchesme and the name Tchesmensky. The Orloff breed of horses is named after him and is a cross of his introduction into Russia. Grigori Vladimir (1777–1826) spent his last years in Paris, wrote in French on Italian history, and edited a polyglot Krylof. Alexei Fedorovitch (1781–1861), a general in the Napoleonic wars, and a famous diplomat, in 1833 effected the Treaty of Unkiar-Skelessi, giving Russia the sole right to pass the Dardanelles. His son Nikolai (1827–85) advocated religious toleration and the abolition of corporal punishment.

ORLOFF (ôr'lŏf) **DIAMOND, The.** See Diamond; Orloff.

ORLOP-DECK, in naval architecture, the lowest deck, consisting of a platform laid over the beams in the hold of a ship of war, whereon the cables were usually coiled, and containing also cabins and storerooms. In merchant vessels it is often a temporary deck. It was first applied to the single deck of a small vessel.

ORMAZD, ôr'măzd. See Ormuzd.

ORMEROD, ôr'mĕ-rŏd, **Eleanor Anne,** English entomologist: b. Sedbury Park, Gloucestershire, 11 May 1828; d. Saint Albans, England, 19 July 1901. She acquired her knowledge of entomology through her own investigations, devoting herself especially to the study of injurious insects. Her advice was sought, and specimens of harmful insects were sent her from all over the world. She was the first woman to be honoured with a fellowship in the Meteorological Society (1878), and with the degree of LL.D. of Edinburgh University (1900), and in 1882 was appointed honorary consulting entomologist to the Royal Agricultural Society. She published 'Cobham Journals' (1879); 'Guide to Insect Life' (1884); 'Annual Reports of Observations on Injurious Farm Insects' (1877 et seq.), etc. Consult the autobiography and correspondence, edited by R. Wallace (1904).

ORMOC, ŏr-mŏk', Philippines, a pueblo of the island of Leyte, situated on the Bay of Ormoc, on the western coast of the island, 35 miles southwest of Tacloban. It is surrounded by a stone breastwork with three ruined forts. It has an important hemp trade. The Bay of Ormoc affords the only safe anchorage on the west coast of Leyte during typhoons. Pop. 8,200.

ORMOLU (French *or moulu,* «ground gold»), in the etymological meaning of the word, ground gold leaf used as a gilt pigment; and by an extension of the term a compound of copper, zinc and tin (sometimes called «mosaic gold»); or a paste of mercury and gold, used for gilding.

ORMOND, ôr'mŭnd, **Alexander Thomas,** American philosophical writer: b. Punxsutawney, Pa., 26 April 1847; d. Grove City, Pa., 18 Dec. 1915. He was graduated at Princeton in 1877; was professor of philosophy and history in the University of Minnesota, 1880–83; of mental science and logic at Princeton, 1883–98; and McCosh professor of philosophy at the latter institution from 1898. He was president of

Grove City College from Aug. 1913 until his death. He published 'Basal Concepts in Philosophy'; 'Foundations of Knowledge' (1900).

ORMOND, Duke of. See Butler, James.

ORMULUM, ôr'mū-lŭm, in early English literature, an English metrical translation of the Gospel history. See English Literature.

ORMUZ, ôr'mŭz, or **HORMUZ,** an island in the Persian Gulf, on the north side, near its entrance. It is about 12 miles in circumference, has a rugged appearance, is entirely destitute of vegetation, has several of the high peaks white from an incrustation of salt, and abounds in iron, copper-ore, and rock-salt. Ormuz was once the emporium of all the riches of India, the receptacle for the gems of Samarkand and Bokhara, and for the manufactures of Europe and Asia. The Portuguese had possession of it from 1515 to 1622, when it was captured by the English and given to the Shah of Persia, who dismantled the city, transferring its commerce to Bender Abbas, on the opposite coast. The town of Ormuz stood on a plain on the north side of the island; and although now only a few scattered ruins, it once contained 4,000 houses.

ORMUZD, ôr'mŭzd, or **ORMAZD,** supreme deity, literally «Lord Wisdom,» in the Zoroastrian religion. The word is a broken down form of the Avestan «Ahura Mazda» and the old Persian «Auramazda,» and these three forms are interchangeable in modern usage. Ormuzd, in the Zoroastrian religion, is represented as the head of the heavenly host and the Lord of all that is good and true. He, however, shows his origin as a sun-god in that he is the great master of light. But even in the old Persian inscriptions he is depicted as the creator of all good, the distributor of rewards and punishments, and the beneficent guardian of mankind. As the religious ideas of the Persians progressed, Ormuzd is more and more represented as a wholly spiritual being; and in the 'Avesta' his spiritual attributes are constantly contracted with the non-spiritual attributes of Ahriman. Here was taking place exactly what was taking place in Egypt. One powerful divinity was gathering to himself all the better attributes of many of the primitive racial gods. There are traces of pantheism in the Persian religion even at a later date; but Ormuzd gained his ascendency, not from this but from a dualism shared by him and Ahriman. He is the good principle, who is continually at war with Ahriman, the bad principle, and the Zoroastrian conception of him was a very noble one, free from any traces of anthropomorphism and from any recollections of nature worship. The influence of this concept on Judaism and Christianity was undoubtedly great, and Ormuzd approaches closely to Jehovah as a high type of the ideal of a national religion. (See Avesta; Zoroaster). Consult Darmsteter, 'Ormazd et Ahriman' (1887); Dhalla, M. N., 'Zoroastrian Theology from the Earliest Times to the Present Day' (New York 1914).

ORNAMENT. Derived from the Latin *ornare,* to adorn. The artistic embellishment of the work of craftsmen, especially in architecture and the industrial arts. Ornament consists of an additional refinement in beautifying a useful or decorative object. Its sphere is strictly limited to the following confines: (1) The utility or purpose of the object ornamented must not be interfered with. (2) The ornamentation must be *fitting* to the object in style, construction and material. (3) The ornament must enhance the interest in the object, that is to say must *mean something* and not be a *purposeless* addition. (4) Ornament must not *hide* the nature of the article embellished. The form and style of ornament must be selected to be in accordance with the surface to which it is attached. The sources drawn upon to supply ornamental motifs consist chiefly of the following: Geometrical configurations, plant and animal forms, and (more rarely) the human figure. The surfaces available are, of course, in the flat or in relief. In the latter case *applied* ornament can be used, that is to say the ornament can be attached to the original finished object. Ornament, therefore, can be divided into three basic branches: High relief, low relief and flat. Another important element entering into the art of ornamentation is consistency in style, the avoidance of anachronisms in period decoration.

History.— Extreme simplicity of ornament is the general rule with prehistoric man, and also with the primitive peoples, in the decoration of their utensils and weapons. Thus we have paleolithic remains (especially from the south of France and Switzerland) from the period of the mammoth and reindeer, which exhibit ornament very similar to that characteristic of the huntsman and primitive tribes of the present day. Waved lines, concentric circles, spirals and uncouth figures are the main motifs. Ornament from the later Stone Age shows an advance in some points in the decoration, especially of pottery, and we get even colored ornament. The Bronze period brings us chiefly geometric ornament. The Early Iron Age has left us remains of plastic ornamental motifs of birds, horses, etc. Roman influence follows and we get the plant motifs of North Europe. In the Merovingian period (500–750) we already find ornament in colored glass pastes, colored stones set cloisonné. The excavations of Schliemann (Troy, Mycenæ, Tiryns) brought forth ornamented antiquities displaying geometric motifs (wave, zig-zag, spiral, etc.) peculiarly similar to Oriental ornament of the period, as also do those from Cyprus. Only gradually do we find the attempt made to represent animals with stiff lines; these are developed at last in the oldest («archaic» style) Greek vases. With the Assyrians we find linear ornament (guilloches) and motifs borrowed from the vegetable kingdom, such as rosettes, blossoms, palmettes, etc. The same must be said of the ancient Egyptians, the lotus flower and aquatic plants prevailing. Alongside these came conventionalized animals (scarabs, the uræus snake, the sparrow-hawk). For textile ornament the Egyptians developed geometric patterns. But it is in Hellenic art that we discover the grandest scheme of ornamentation. Here ornament was developed to a systematic science, so that every decorated space received only that style of motif best suited for that special purpose, forming fixed types. Meanders and palmettes are the chief linear and vegetable ornament. The Etruscans advanced from the crude *impasto* to their *bucchero* ware decoration using a roller with carved intaglio motifs to *string* out a continuous series of medallions or other "repeat" designs on their pottery. The Romans in their burial chambers (*columbaria*), on the walls of their country villas, and at Pompeii, etc., show their love of richly-colored mural ornament (Greco-Roman) in which the perfected human figure developed by the artists of Athens finds plentiful display. And it is from this ancient ornamental work (rediscovered in the 15th century) that the great Renaissance ornament grew. The Byzantine ornament, taken from the Oriental, was limited to vegetable and linear forms, relying for its attractions on the clever color contrasts. With the Arabs, Moors and Persians ornament relied on the late Greek and Byzantine elements brought out in great richness and fantasy. Oriental influence is seen also in the book ornament (*illumination*) of the old Irish and Russian monasteries. Much of the Persian decorative cult of the Middle Ages is derived from the East Indian, the Chinese and even the Japanese. And, it must be remembered, the art of the eastern Asiatics is chiefly one of ornament. In the 18th century this Oriental style influenced greatly European decoration. Going back again, the Greco-Roman ornament led to the Romanesque and ruled strictly in the architectural interiors from the 10th to 13th centuries. Taking its elements from a study of nature, it reproduced, in fantastic liberality, the animal figures which make up its system. With the arrival of the Gothic style we revert again to vegetable motifs chiefly, later to naturalistic depiction, degenerating soon to overloading and meaningless display. In Italy the Renaissance was utilizing the classic simplicity or the rich Greco-Roman ornament disclosed in the excavations of Pompeii. The beauty of the work was infectious and France and Germany, the Netherlands and later Spain were importing Italian artists to decorate the palaces with Renaissance ornament. But the dainty refinement of French artists naturally soon gave native qualifications to the Italian style and the Rococo came into being with all its light coquetry and fantastic figures and contortions. In Germany ornament degenerated into the Barock with its heavy ostentation. But the grace and playful lightness of Rococo gave place to the Louis XVI style with its return to the severe classic ornament, following, for the most part, a close imitativeness of the antique patterns. This again was followed by the "Empire style," even stiffer in ornament than the former. And with the 19th century we arrive at the outcome of the artist to cast aside the thralls of past styles and to achieve freedom of originality and genius. The French termed the period *Art Nouveau*, the German called it *Jugend* (Youth). With a few certain prominent exceptions the ornament was mediocre, tending to refinements perhaps or even vigor, according to the exponents. But *New Art* bids fair to be soon forgotten as an independent entity. Technique is mastered and prettiness effected often, but of master minds none has arisen.

Masters of Ornament.— Space forbids more than mention of a few of the "little masters" of the French styles and those artists who aided from their genius. To *Renaissance* belong Ducerceau, Philibert Delorme, Étienne Delaulne (Stephanus), Réné Boivin, Pierre Woeriot. To *Louis XIII style* belong Vouet, Stella, Adam Philippon, Abraham Bosse, Gédéon Lesgaré, Jacquard, Toutin, Jousse. Leaders of the prolific *Louis XIV style* are Jean Lepautre, Charles Lebrun, Jean Marot, Daniel Marot, Charles André Boule, Jean Bérain, Gilles Lesgaré, Bernard Picard, Gribelin, Vauquer, Toro. To the *Regency* period belong Robert de Cotte, Gilles Marie Oppenort, Antoine Watteau, Claude Gillot. Leaders in the origination of the *Louis XV style* are Boffrand, Delajoue, Meissonnier, Cuvilliées, Blondel, Eisen, Boucher, Pillement. *Louis XVI style* is largely due to Lacotte, Vien, Salembier, Quéverdo, Delafosse. And to Percier and Fontaine are chiefly due the *Empire Style.*

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CLEMENT W. COUMBE.

ORNAMENTAL GRASSES. See GRASSES IN THE UNITED STATES.

ORNAMENTAL PLANTS. See PLANTS.

ORNAMENTS RUBRIC, The, a rubric in the Book of Common Prayer about which there has been much controversy. It is set down as follows, just before the Order of Morning Prayer: "And here it is to be noted that such ornaments of the Church and of the ministers thereof, at all times of their ministration, shall be retained and be in use as were in this Church of England, by the authority of Parliament, in the second year of the reign of King Edward the Sixth." Ornaments in this connection have been defined by a Committee of the Privy Council as "all articles used in the divine service." The Puritan opposed the retention of the rubric in 1661, but it has remained despite powerful efforts to eliminate it. For the controversy regarding its interpretation see RITUALISM, and consult Parker, 'The Ornaments Rubric' (Oxford 1881).

ORNDORFF, William Ridgely, American chemist: b. Baltimore, Md., 9 Sept. 1862. He was educated at Baltimore City College and in 1884 was graduated at Johns Hopkins University. Subsequently he studied at the universities of Greifswald, Berlin, Heidelburg and Munich. In 1887–90 he was instructor in chemistry; in 1890–98 assistant professor of organic chemistry, in 1898 of organic and physiological chemistry and since 1902 professor of organic and physiological chemistry at Cornell University. In 1890 Dr. Orndorff was special agent of the United States census and has served on the jury of awards at most international expositions of recent years. He is contributor to the *American Chemical Journal, Berichte der deutschen Chemischen Gesellschaft, Journal of the American Chemical Society* and the *Journal of Physical Chemistry.* He has published 'Laboratory Manual of Organic Chemistry' (1894) and a translation of E. Salkowski's 'Laboratory Manual of Physiological and Pathological Chemistry' (1904).

ORNITHODELPHIA. See MONOTREMATA.

ORNITHOLOGICAL SOCIETIES IN THE UNITED STATES, began with the formation of the Nuttall Ornithological Club in Cambridge, Mass., in 1872–73. The study of birds had been an important part, previously, of several societies and institutions for research, but only about Boston were there enough bird students at that time to form a special society, since the large group of ornithologists then resident at Washington was engaged in the more general field afforded by their biological society. Among the founders of the Nuttall Club were William Brewster, Ruthven Deane, J. A. Allen, H. A. Purdy, C. J. Maynard and Ernest Ingersoll. The club increased and have published occasional memoirs of value. This club was the prime mover in organizing, in 1884, the American Ornithologists' Union (ordinarily called «A. O. U.»), patterned after similar organizations in Europe. Its fellows and members are limited to persons of a certain high standard of scientific attainment, while its «associates» include several hundred amateurs. Its annual open meetings are held in different cities, and are called «conferences»; while occasionally it participates in an international congress. The A. O. U. publishes *The Auk,* a quarterly of high scientific value, edited by J. A. Allen. Of more local character are such associations as the Delaware Valley Ornithological Club, founded at Philadelphia in 1890, which issues an annual publication, *Cassinia,* edited by Witmer Stone; the Cooper Ornithological Club (1893), which devotes itself to the bird-life of the Pacific Coast and Alaska; it has sections in San Francisco and Los Angeles, and publishes an illustrated magazine, *The Condor,* every two months, edited by Joseph Grinnell; the Maine Ornithological Society, founded in 1893 and centralized in Portland, which publishes a modest journal; the Nebraska Ornithologists' Union, begun in 1893 at the State University; the Wilson Ornithological Club, originating at Oberlin College, Ohio, and fostered by Prof. L. Jones, which issues a quarterly, *The Wilson Bulletin,* devoted to bird life in the Central States. In close connection with these, but devoting its energies to the protection of birds and the education of children, is the National Association of Audubon Societies (q.v.). Many local bird clubs, however, exist in the United States and in Canada, such as the McIlwraith Club, at London, Ontario, the Bird Lovers in Cleveland, Ohio, etc.

ERNEST INGERSOLL.

ORNITHOLOGISTS UNION, American. See AMERICAN ORNITHOLOGISTS UNION.

ORNITHOLOGY, the science which treats of birds. It is susceptible of such a broad interpretation that it is difficult to define its limits with accuracy, and of late years certain of its branches have become to such an extent matters of popular interest that we are coming to use the term «bird study» to distinguish them from purely scientific ornithology. Ornithology proper, then, may be said to treat of the classification of birds,— both the phylogeny of the group as a whole and the definition of the numerous species and varieties — which involves anatomical, morphological, embryological, and physiological investigations and studies of both the living and dead bird. Geographic distribution and migration also form important branches of ornithology, and though the former pertains equally to other branches of zoology, as well as to botany, it has nevertheless been studied very largely from the side of the birds.

Structure.— Birds, being eminently aerial, the anterior pair of limbs are modified into wings, and the bones of the hand are so much reduced that portions of two digits only remain. The peculiarities of feathers and other accessories to flight are described elsewhere. See FLIGHT; PLUMAGE.

Considering other peculiarities in the general structure of birds, we find the skull bones to be united to a remarkable degree, so that almost all traces of the components are lost. In the head of the adult bird, besides the skull proper and the lower jaw, are only four separate bones, excepting the hyoids that support the tongue. These are the two *quadrates,* which lie between the articulating surface of the lower jaw and the skull — a peculiarity of birds as compared with mammals, in which the mandibles articulate directly with the skull, and showing their closer alliance with reptiles; and the two *pterygoids,* which connect the quadrates with the palate. The skull is poised upon the spinal column by a single condyle, as in reptiles, and not by two condyles, as in mammals. The eye of birds is relatively very large, and the ear is situated rather below and behind it, but does not protrude externally and the situation of the opening is not noticeable, except for the slightly different sort of feathers that usually cover it. No living birds are provided with teeth, the mandibles being covered with a horny sheath forming the bill, which has sharp cutting edges, and is modified in form according to the habits of the various species. The feet of birds show even a greater degree of adaptive modification than the bill, and inasmuch as these two are the only parts of a bird not covered by feathers, it is not surprising that all the older classifications were founded almost exclusively upon them. The ankle bones (as well as the bones of the wrist) are lost very early in the development of the bird, and become entirely combined with the ends of the adjoining bones, so that the so-called tarsus, a fusion of all the tarsal bones, includes, in addition, the metatarsal elements, and is more properly known as the «tarsometatarsus.» The fibula in most birds is more or less reduced, the lower portion ending in a sharp point, and not reaching the end of the tibia, as is familiar to us in the «drum stick» of the chicken. The femur and a large portion of the tibia are covered by the skin of the body so that the entire external part of the bird's leg is in reality the foot, the long «tarsus» with its usual horny covering corresponding to the flat portion of the human foot, while the bend where the feathering begins is the heel. In other words, the average bird carries its heel high up in the air and walks or grasps with the toes, which are at the other end of a very long instep. The toes themselves are never more than four,— usually one directed backward and three forward, making a grasping foot. Sometimes, however, one of the front toes is reversed, as in the woodpeckers, or all may point forward, as in some swifts. Certain woodpeckers have but three toes, while all birds which habitually walk, and most of those that swim, exhibit a great reduction or total loss of the hind toe.

The modifications in webbing and other peculiarities of foot-structure are very numerous. Most swimmers have two webs, uniting the three functional toes, while the cormorants, pelicans, etc., in which the hind toe is well developed, have three webs.

The neck of birds is usually long, the vertebræ moving easily upon one another, so as to permit great flexibility. The body cavity is well encased by the bony structure, but owing to the length and construction of the ribs is likewise very flexible. Its most peculiar characteristic is the remarkable development of the sternum or breast-bone, which is expanded into a broad, flat structure. Sometimes, as in the ostriches and their allies (non-cerinate or ratite birds) it is smooth on the anterior surface, but in other living birds (carinate) it is provided with a vertical keel. It is to this that the great flight-muscles of the breast are attached; and while the presence or absence of a keel was formerly looked upon as of primary importance in tracing the ancestry of birds, it is now regarded more as an indication of the extent to which the power of flight has been lost. On the back of the body cavity is another solid, bony structure known as the sacrum, formed by the fusion of the lower vertebræ and the pelvis. The clavicles or «collar bones» of a bird also present a peculiar appearance, being usually firmly ossified at their lower extremities, forming a V-shaped bone known as the furculum or popularly the «wish-bone.»

As to the soft anatomy of birds, a characteristic avian structure is seen in the thick-walled muscular gizzard, which is a prominent feature of the stomach of all birds which devour hard substances such as grain, horny insects, etc., though practically absent in birds of prey and fish-eating species whose food is soft. All birds with well developed gizzards swallow small particles of gravel, sand, etc., which by the action of the muscular walls grind up the food that they have swallowed and render it suitable for digestion, performing, as it were, the work of the molars or grinding teeth of mammals.

The complicated voice-organ or syrinx, comprising the lower portion of the larynx, is another organ peculiar to birds, and the arrangement and number of the muscles that contract the horny rings by which the vocal chords are controlled, have recently been found to be of fundamental importance in avian classification. This organ is only highly developed in the singing birds (*Oscines*).

Classification.— Owing to the great amount of attention that has been devoted to systematic ornithology through long periods of years, we find that it is through this branch also that the «science» of nomenclature has reached its present formidable development. Although of equal importance to all systematists, it is the ornithologists who have been responsible for the earlier and the more important codes that have been formulated to govern the formation and adoption of our technical systematic names. From the time of Aristotle scientific literature has been full of attempts to classify birds. The earlier schemes naturally dealt with external characters only, and as feathers were common to all, the only available parts were the bill and feet. There were two grand divisions. Water Birds and Land Birds, while under these came the waders, swimmers, divers, etc.; the birds of prey, gallinaceous birds, *Fissirostres, Conirostres, Tenuirostres*, etc.

In 1813 Merrem proposed to separate the birds with a smooth breast-bone (ostriches, etc.) from the rest of the class — which all possess a keel on the sternum. This was an important advance, and the first recognition of the modern groups *Ratitæ* and *Carinatæ*. In 1827 a Frenchman, L'Herminier, made an extended study of the skeletal structure of birds and brought to light many points of relationship between birds hitherto regarded as distinct and vice versa. The cranes and herons were shown to be wrongly associated, and similarly the gulls and petrels, while the relationship between the gulls and the plover tribe was pointed out. Thus were the long accepted groups of «waders» and «swimmers» rudely shattered and the external resemblance in foot-structure was shown to be superficial.

The classification of birds, always a puzzle, now became still more complex, and all parts of the avian structure were investigated in the hope of reaching some set of characters that would prove the solution of the problem. The idea seemed to be then prevalent — and is still so in the minds of some systematists — that some one part of the bird's structure would furnish characters upon which a satisfactory classification could be established. Nitzsch made numerous anatomical investigations, but his most important discoveries were in connection with pterylography, showing that the number and shape of the feather-tracts differed widely in different groups. McGillivray and Müller studied the soft anatomy, and the latter was the first to divide the passerine birds into *Oscines* (singing birds) and *Clamatores*, by pointing out the difference in the number and character of the vocal muscles. Sundevall considered the physiological side of the subject and was the first to define Altricial and Precocial birds — those respectively that are hatched helpless and reared in a nest and those that run about as soon as leaving the egg. Up to this time classification meant a search for similarities with the object of arranging species in definite groups and families. In the minds of some the whole matter was one of mathematical exactness and in this connection the circular system outlined by Swainson in his 'Geography and Classification of Animals' is interesting reading. There now came a revolution in the classification of birds, as well as of other groups. In 1859 Darwin published his 'Origin of Species,' and his work, as well as that of Alfred Russell Wallace, soon put classification in a new light. It was realized that the birds of to-day are the terminal branches of a great family tree of bird-life whose trunk and early limbs are far back in the geological past, where they merged into the trunk which has produced the modern reptiles. Some of our present bird-families, notably those most numerous in species, are comparatively recent developments, suited in every way to prevailing conditions; while others, usually with few representatives, are the remnants of ancient groups which belong much farther back on the tree, and have barely survived to the present time. The significance of fossil-forms now become evident, as well as the fact that birds could not be arranged in a lineal series and preserve their proper relationship. It was also clear that in tracing the phylogeny of birds all sorts of characters must be taken into consideration; since modification in one part may have been important at one time, or in one group, while in another group some other part was the seat of variation.

The principal contributors to the modern classification of birds are as follows:

Huxley in 1867 made a study of birds' skulls and demonstrated the importance of the arrangement of the bones of the palate as an aid to classification, defining the several types of palate-structure known as dromæognathous, desmognathous, schizognathous and ægithognathous. Garrod and Forbes made important additions to our knowledge of the muscular anatomy of birds and in 1888 Fürbringer published probably the greatest treatise on avian phylogeny that has yet appeared. One of his most important discoveries was that of the descent of the ostriches and their allies from flying ancestors, showing them to be a degenerate and not a primitive group.

In spite of the vast amount of attention that has been given to the subject, we are still far from solving the problem of avian classification. The great rarity of fossil birds leaves gaps in the system which it is almost hopeless to expect to fill; and although ornithologists are pretty well agreed upon a number of the leading groups, their exact phylogeny will remain a matter of guesswork unless comparative embryology shall solve the problem. It is a well-known fact in zoology that the embryonic development of the individual in the main represents the palæontological development of the species; and if embryo birds have been saved and studied by zoologists, instead of the empty shells of the eggs, we might to-day be much farther along on our way.

The present views of bird-classification are briefly as follows: We have two distinct branches of existing birds, the degenerate *Ratitæ* and the *Carinatæ*. The former represented by four orders: 1, the Apteryxes of New Zealand; 2, the cassowaries and emus of the Australian region; 3, the rheas of South America; and 4, the ostriches of Africa and Arabia.

Among the *Carinatæ* we have, first of all, the tinamous (*Crypturi*), a sharply defined group of birds recalling the gallinaceous type in external appearance, but with many points of resemblance to the *Ratitæ*. The penguins (*Sphenisci*) are a degenerate group of somewhat doubtful affinity, which Dr. Stejneger regards as differing more from any of the remaining birds than they do from each other; while other authorities place them as a distinct order, but in alliance with the loons. The latter, together with the grebes, form a natural order *Pygopodes*, while the petrels and albatrosses form another, *Tubinares*. The relationship of the auks (*Alcidæ*) has been in some doubt, but they are now most frequently placed near the gulls (*Gaviæ*). The latter have much in common with the plover and sandpipers (*Limicolæ*), and the sheathbill (*Chionis*) is in many respects intermediate; together with the bustard (*Otididæ*) they seem to form another natural order. Three other groups of "water" birds constitute well defined groups: (1) The *Anseriformes*, ducks and geese, with the outlying horned screamers (*Palamedea*) and flamingos; (2) the storks and herons; and (3) the *Steganopodes*, or totipalmate swimmers; that is, cormorants, pelicans, etc. The last-named bear affinity to the hawk-tribe (*Accipitres*), which, with the American vultures, form a distinct group, their only other alliance being a possible one with the herons through the secretary bird (*Serpentaria*). We have left the cranes (*Gruidæ*), rails (*Rallidæ*), and trumpeters (*Psophiidæ*), which form an order *Gruiformes*; and several very puzzling forms which are generally placed in the neighborhood of the rails, though they have no near relatives and some, at least, are generalized forms descended from earlier branches of the family tree and consequently exhibiting characters possessed by several distinct modern families. Such birds are the seriema, sun-bittern and kagu.

We next have the great gallinaceous assemblage, near which are placed the sand-grouse (*Pterocles*) and the pigeons (*Columbæ*). While that curious bird, the hoactzin, the representative of a distinct order, seems in some respects a connecting link between the gallinaceous type and the plantain-eaters (*Musophagidæ*), which stand near the cuckoos. From this point we pass to a number of groups, some of them very sharply defined, others less so; as, for instance, the woodpeckers (*Pici*), parrots (*Psittaci*), owls (*Striges*), whip-poor-wills, etc. (*Caprimulgi*), swifts (*Cypseli*), humming-birds (*Trochili*), etc. The complete separation of the owls from the hawks seems borne out by all modern researches and their true position is probably in the neighborhood of the *Caprimulgi*. Last of all come the *Passeres*, divisible into two sub-orders and comprising far more species than all the other orders combined, but so hopelessly are the species interrelated that only a very few clearly circumscribed families can be distinguished, of which the swallows (*Hirundinidæ*) are one of the best. Just which species of passerine birds are the highest; that is, the most specialized, is a matter concerning which there is much difference of opinion and the thrushes, crows and finches have each been awarded the honor.

The following scheme, slightly modified from that of Dr. H. Gadow, will show approximately the present ideas of classification. Phylogenetically we may regard the *Colymbomorphæ* and *Pelagomorphæ* as branches of one stock, while the *Alectromorphæ* came away independently. The *Coraciimorphæ* have branched off from the last named, the hoactzin and the plaintain-eaters representing one point of alliance. The *Ratitæ*, on the other hand, are a degenerate group probably from the same ancestry as the tinamous.

RATITÆ.

The Ostrich tribe and certain Fossil allies.

CARINATÆ.

Colymbomorphæ:
I. Sphenisciformes,— Penguins.
II. Colymbiformes,— Grebes and loons.
III. Procellariiformes,— Petrels and albatrosses.
Pelagomorphæ:
I. Ciconiiformes,—1, Cormorants, etc.; 2 herons; 3, storks.
II. Anseriformes,— 1, Palamedea; 2, ducks and geese; 3, flamingos.
III. Falconiformes,—1, Cathartæ; 2, hawks, etc.
Alectromorphæ:
I. Tinamiformes,— Tinamous.
II. Galliformes,— 1, Hemipods; 2, gallinæ; 3, hoactzin; 4, sand grouse; 5, pigeons.
III. Gruiformes,— 1, Sun-bitterns; 2, rails; 3, cranes; 4, trumpeters; 5, seriema.
IV. Charadiiformes,— 1, plovers, etc.; 2, gulls and auks.
Coraciimorphæ:
I. Cuculiformes,— 1, cuckoos, etc.; 2, parrots.
II. Coraciiformes,— 1 Coraciæ; 2, owls; 3, caprimulgi; 4, swifts; 5, colies; 6, trogons; 7, woodpeckers.
III. Passeriformes,— 1, Eurylæmidæ; 2, clamatores; 3, menuridæ; 4, oscines.

The number of species of birds is enormous and a very large portion of ornithological literature has to do with their description, a work which is still progressing; for though it is probable that nearly all the distinct forms of bird-life have been discovered and described, there is still an abundance of closely allied geographic races to be distinguished. This refinement in separation of species and «varieties» in ornithology early reached a point far in advance of that attained in any other group of vertebrates and the effects of peculiar environment and isolation in the evolution of species was apparently first clearly recognized from the study of birds. In some countries, notably in North America, the birds have been so closely examined over large areas that it is possible to trace the exact effect of peculiar climatic conditions upon color, and parallel examples are furnished by several different types of birds. The recognition of large numbers of closely allied geographic races, while deplored by those who would keep our nomenclature within the limits of convenience, is of the greatest importance in broader scientific research. Not only are valuable data thus obtained for the study of the evolution of species in its relation to geographic, distribution and environment, but by recognizing certain peculiarities, however slight, as characteristic of birds breeding in a certain district, it is possible to identify the same form in its winter quarters or *en route;* and already data are being collected in the United States which before long will throw much light upon the exact course of the migration. The recognition of these geographic races in ornithological nomenclature resulted in the adoption by many ornithologists, notably Americans, of a trinomial system instead of the binomial system of Linnæus, and geographic forms are now denoted by a «subspecific» name attached to the generic and specific ones, as, for example, *Melospiza melodia fallax.* This very materially alters our old conception of a species, just as the theory of evolution modified the conception of orders and families, and we are now coming to recognize that species and subspecies (they differ only in degree) as we find them to-day are forms differentiated from one another in variable degree, some perfectly distinct, others so slightly as barely to be appreciable. The attempt to denote the degree of variation by any system of names is bound to express merely individual opinion and this explains much of the constant controversy over nomenclature.

The beauty of birds has appealed to the artistic side of many men and many early ornithologists were artists and regarded the colored plates in their books as of perhaps more importance than the text. As examples of ornithological works of this sort may be mentioned Catesby's 'Natural History of Carolina,' Wilson's 'American Ornithology,' and Bonaparte's supplement to it; the elephant folios of Audubon and the many sumptuous works of John Gould. Of recent years the perfection of photographic apparatus has made possible the photography of living birds in all the functions of life, which has proved of great scientific value. By thus bringing together accurate pictures portraying widely scattered species we have material from which valuable deductions are likely to be made. See ANIMALS, CLASSIFICATION OF; BIRDS.

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ORNITHOPODA, a group of dinosaurs, now included in the *Orthopoda* (q.v.).

ORNITHORYCHUS. See DUCKBILL.

ORNITHOSAURIA, the pterodactyls. See PTEROSAURIA.

ORNITHOSCELIDA, a group named by Huxley to include certain genera of dinosaurs (*Iguanodon, Megalosaurus,* etc.), which "present a large series of modifications intermediate in structure between reptiles and birds," though there is no reason to believe that they are directly ancestral to the birds.

ORNITHOSTOMA, the generic name of a huge pterodactyl from the Cretaceous rocks of Kansas, which is probably identical with *Pteranodon.* See PTERODACTYLS.

OROBANCHACEÆ, the broom-rape family. The general properties of this family of plants are astringency and bitterness. The calyx is equally divided into four or five teeth, persistent, inferior; the corolla hypogynous, irregular, persistent, æstivation imbricated; stamens, four; ovary free, one-celled, with two carpels; style, one: stigma two-lobed, divided transversely to the carpels; fruit capsular. The *Orobanchaceæ* are herbaceous parasites, with scales in place of leaves. They attach themselves to the roots of different plants, and have received the name of broom-rapes from the ravages they are supposed to commit among plants of the broom family. The different species attach themselves to different plants, as the *Orobanche major* to broom and furze, *O. ramosa* to hemp, *O. rubra* to thyme, *O. hederæ* to ivy. The central cellular portion of the stems is surrounded by fibro-vascular bundles, which connect themselves with those of the plants to which they attach themselves. They have also tubers and ordinary roots, from which it is supposed they may derive nourishment from the soil. See CANCER-ROOT; BROOM RAPE.

OROBUS. See BITTER VETCH.

OROGRAPHY, a term applied to the study of mountains, their chain, branches, etc. The study includes the method of measuring the heights of mountains by trigonometrical survey. The great difficulty to be encountered in this method of measurement arises from the optical illusion occasioned by the different states of the density of the atmosphere, causing a proportionate change of refraction, which may, however, be corrected by hygrometric observation. In modern times it has been usual to ascertain the heights of mountains by barometrical observation. See BAROMETER; GEOGRAPHY; MOUNTAINS; SURVEYING.

OROHIPPUS. See HORSE, EVOLUTION OF.

OROIDE, or **OREIDE,** an alloy, a substitute for ormolu. There are two formulæ for composing it. In the first the ingredients are copper, 100.0; tin, 17.0; magnesia, 6.0; sal-ammoniac, 3.6; quicklime, 1.80; argol or unrefined tartar, 9.0. In the second, less brilliant than the former, zinc is substituted for the tin. The metals are first melted; the other ingredients, after being thoroughly incorporated together by powdering and mixing, are slowly added; and the whole is kept in a state of fusion for about an hour, and the scum removed from time to time.

ORONHYATEKHA, "burning sky," Mohawk Indian: b. on the reservation of the Six Nations, Brantford, Ontario, Canada, 1841; d. Augusta, Ga., 4 March 1907. He attended Toronto University, Canada, and while there organized one of the first "Wild West" shows in which he and some of his Indian friends played the leading parts. With this he made frequent trips about the neighboring towns and thus earned money enough to pay his college expenses. This show made the Indian boy a well-known figure in Canada and along the bordering American States. On the occasion of the visit of the Prince of Wales to Canada in 1860, Oronhyatekha was elected by the Six Nations Indians to deliver, in their name, an address of welcome to the future king, Edward VII. The latter was so impressed with the vivacity, intelligence and oratorical powers of the young Indian that he invited him to England to continue his studies in Oxford. The offer was accepted and Oronhyatekha entered the famous English centre of learning under the protection of Sir Henry Ocland, though it was generally understood in Canada that his expenses were being paid by Queen Victoria. Oronhyatekha was graduated in medicine from Oxford. On his return to Toronto he married a granddaughter of the famous Mohawk chief, Brant. He became a well-known figure in medical circles and secret society lodges. In 1902, at Chicago, he was elected president of the National Fraternal Congress. With the secret societies of his ancestors in mind, he evolved the idea of the Independent Order of Foresters, which he founded in 1881 and of which he remained Grand Ranger until his death. In behalf of this organization he traveled extensively throughout the United States and Canada, where he had the reputation of being a very forceful and ready speaker in both English and Mohawk. He was the most prominent among the speakers at the Indian centennial held at Tyendinaga, Canada, 4 Sept. 1884. He was a student of things Indian and has left a valuable treatise on the Mohawk language.

ORONO, ō'rō-nō, Maine, town, Penobscot County, on the Penobscot River and the Maine Central Railroad, seven miles northeast of Bangor. It was settled in 1774, and became a town in 1806. Its chief industry is the manufacture of lumber, and it contains a number of lumber mills, also pulp and paper mills. It is the seat of the University of Maine, including the agricultural college and the experiment station. Pop. 3,555.

ORONTES, ō-rŏn'tēz, the classic name for the modern AASI, or Nahr-el-Asi, a river rising on the east of the Anti-Libanus, in a natural basin of rock, the site being marked by an ancient monument. It flows north through the plain of Hamah to the Lake of Antioch, and thence southwest into the Mediterranean. Its entire course is about 200 miles, though its valley was, for many centuries, the highway to and from Egypt.

OROPUS, ō'rō-pŭs, town of Attica, in ancient Greece, situated on the frontier of Bœotia and celebrated as the site of the temple of Amphiaraus. It was a famed place of pilgrimage in the ancient world. Consult Dürrbach, 'De

Oropo et Amphiarai Sacro' (Paris 1890) and Frazer, J. G., 'Pausanias' (Vol. II, London 1898; 1913).

OROSIUS, ō-rō'sĭ-ŭs, **Paulus**, Spanish historian and theologian: b. Tarragona, Spain, about 390 A.D. He became a Christian presbyter, resided a considerable time with Saint Augustine at Hippo and wrote, at his suggestion, a general history of the world, 'Adversus Paganos Historiarum Libri VII,' to prove that the Christians were not to blame for the downfall of the Roman Empire as the heathen alleged. He tries to picture the wretchedness and evils of the heathen period in as dark colors as possible, making use of the works of Livy, Tacitus, Suetonius, and other Roman writers. His history, however, is regarded by scholars as being of little value, though it long enjoyed a great popularity, and was translated into Anglo-Saxon by Alfred the Great with modifications and additions. Orosius is also said to have written a work on the errors of Priscillian and Origen, and still other writings are attributed to him. His history has been edited by Zangemeister (1882), and several English translations and editions of Alfred's translation have been published. Consult Mörner, T. de, 'De Orosii Vita' (Berlin 1844).

OROTAVA, ō-rō-tä'vä, Canary Islands, a town in the northwest of the island of Tenerife, formerly the capital and court of the principal kingdom of the Guanches. It is regularly built, and among its buildings are a beautiful church with three naves, and an English church. In a valley east of the town is a botanic garden. Orotava is a summer resort much frequented by European health seekers. It has an export trade in wine and cochineal. Pop. about 12,000.

O'ROURKE, Edmund. See FALCONER, EDMUND.

OROVILLE, Cal., city and county-seat of Butte County, on the Southern Pacific, the Western Pacific, and the Northern Electric railroads, 75 miles north of Sacramento. It is located in a region with large fruit-growing, stock-raising and other agricultural interests and nearby are Feather River Canyon and the Falls of Fall River. The city has a Carnegie library, fruit and olive packing and curing stations, railroad repair shops, etc. Pop. 3,859.

OROZCO Y BERRA, ō-rōs'kō ē bĕr'rä, **Manuel**, Mexican historian: b. City of Mexico, 8 June 1816; d. there, 27 Jan. 1881. He studied both law and engineering and became editor of *El Porvenir* in 1846. He held numerous positions of trust under the government, was professor in the National Military School and became judge of the Supreme Court of the nation in 1863. In 1852 was appointed director of archives, and later he was director of the National Museum and Councillor of State during the régime of Maximilian. After the return of Juárez to power, Orozco was imprisoned for a while. On his liberation he devoted his time to archæology and kindred studies. Orozco had a very logical and scientific mind; and no name stands higher as a scientist than his in Mexico. His vast scientific work is a mine of wealth in all that relates to ancient Mexico. He was the first great «Americanista» in his own land and since his day none of his countrymen have surpassed him in Indiology and profound knowledge of ancient Mexico. Among his published works are 'Geografiá de las lenguas y carta etnográfica de México' (1864), and 'Historia de México,' his most famous work (1880–81).

OROZCO Y JIMENEZ, Francisco, Mexican bishop and historian: b. Zamora, Mexico, 19 Nov. 1864. He was educated at the College of Jacona, Mexico, the South American College and Gregorian University, Rome, and in 1887 was ordained to the priesthood. He was successively professor of Latin at Zamora Seminary, professor of philosophy, theology, Scripture, liturgy and Hebrew in the University of Mexico, chaplain of Saint Francis' and vice-rector of the School of Arts, Zamora, and vice-rector of the Seminary at Mexico City. From 1902–12, Dr. Orozco y Jimenez was bishop of Chiapas and in the latter year was transferred to the see of Guadalajara. In January 1917 the Carranza government ordered his deportation. He established the first electric plant and erected a public monument to Las Casas at S. Cristobal Las Casas, Mexico. The bishop was president of the labor section at the Catholic Congress of Oaxaca. He has published 'Colección de documentos para la historia le Chiapas,' and numerous contributions to the religious press.

ORPHANS' COURT, in Pennsylvania and a few other States, where it occupies a position similar to that of the surrogate; devoted largely to probate matters, such as the granting of letters of administration; to take proof of wills and to direct and control estates and the settlement of accounts of executors and administrators. See also COURT.

ORPHEUS, ôr'fūs, in Greek mythology, an important personage, surrounded by a multitude of legends, which invariably associate him with Apollo and the Muses. To him is attributed the application of music to the worship of the gods. Apollo presented him with his lyre, and the Muses instructed him to use it, so that he moved not the beasts only, but the woods and rocks with its melody. Having lost his wife, Eurydice, by the bite of a serpent he descended to Hades to try and get her back. His music so moved the infernal deities, Pluto and Proserpine, that they consented to her return to earth, only her husband, whom she was to follow, must not look back till they had reached the upper world. This condition the impatient Orpheus violated and lost his wife forever. He is said to have met his death at the hands of a band of furious women engaged in the mystic rites of Bacchus. He is represented as one of the Argonauts, and to him is ascribed the origin of the so-called Orphic mysteries connected with the worship of Bacchus. The bulk of the poems attributed to Orpheus in modern times have been proved to be forgeries of Christian grammarians of the Alexandrian school. A portion of them, however, belong to the time of Onomacritus, or earlier, and include hymns, a theogony, a poem called 'Minyas, or the Descent Into Hades'; oracles and songs for initiation, and sacred legends. Among those who have investigated the Orphic writings are Ottfried Müller, Grote and Lobeck. See also APOLLO; BACCHUS; EURYDICE; MUSES.

ORPHEUS C. KERR, the pseudonym of ROBERT HENRY NEWELL (q.v.).

ORPIMENT, the native mineral, yellow sulphide of arsenic, As_2S_3. It forms rhombic trimetric prisms of translucent lemon-yellow color. Its specific gravity is 3.45, and its hardness 1.5–2. It is very poisonous. It was formerly used as a pigment and was known as king's yellow.

ORPINE, or **LIVE-FOREVER,** a perennial herb (*Sedum telephium*) of the family *Crassulaceæ*. It is a native of Europe and northern Asia, whence it has been introduced in cool climates throughout the civilized world. Though it produces few blossoms it spreads rapidly by means of its roots. Thrifty specimens attain heights of 15 to 18 inches, bear obtuse, oval, toothed, fleshy leaves, and pink or sometimes white flowers in dense rounded cymes, both terminal and lateral. Several horticultural varieties are used in rock-gardens and places where little attention is required.

ORR, ôr, **Hugh,** American inventor: b. Lochwinnoch, Renfrewshire, Scotland, 13 Jan. 1717; d. Bridgewater, Mass., 6 Dec. 1798. He came to America in 1737 and settled at Bridgewater, where he began work as a gunsmith and manufactured edged tools. In 1753 he invented a machine for dressing flax, and his other inventions were many. He was an ardent patriot in the Revolutionary War, and erected a foundry, where he cast cannon and shot for the army. After the war he became a member of the Massachusetts senate.

ORR, James, Scottish theologian: b. Glasgow, 11 April 1844; d. 6 Sept. 1913. He was educated at Glasgow University and the Theological Hall of the United Presbyterian Church. He entered the ministry and was pastor of East Bank Church, Hawick, 1874–91; in 1895 lectured in Chicago on German theology, and in 1897 lectured on the Elliot and Morgan foundations at Allegheny, Pa., and Auburn, N. Y. He was professor of church history in the United Presbyterian Theological College, Scotland, 1891–1901 and from 1901 until his death was professor of apologetics and theology in the Glasgow College of the United Free Church. He took a prominent part in the union of the United Presbyterian and Free churches. He published 'The Pulpit Commentary' (1891); 'The Christian View of God and the World' (1893); 'The Supernatural in Christianity' (1894); 'Early Church History and Literature' (1901); 'The Progress of Dogma' (1902); 'David Hume' (1903); 'The Image of God' (1905); 'Problems of the Old Testament considered in Relation to Recent Criticism' (1906); 'The Resurrection of Jesus' (1908); 'Sidelights of Christian Doctrine' (1909); 'History and Literature of the Early Church' (1913).

ORR, James Lawrence, American legislator: b. Claytonville, S. C., 12 May 1822; d. Saint Petersburg, Russia, 5 May 1873. He was graduated from the University of Virginia in 1842, admitted to the bar in 1843 and established a law practice in Anderson, S. C., also editing the Anderson *Gazette*. He was elected to the State legislature in 1844, served two terms, and in 1848–59 was a member of Congress, officiating as speaker of the House in the 35th Congress. A strong opponent of secession, he opposed it as long as possible, and then followed the lead of his native State. He commanded one of the first Confederate regiments raised in South Carolina, but in 1862 entered the Confederate Senate, of which he was a member until the close of the war. He was the first governor of South Carolina after the restoration of her rights as a State of the Union, serving from 1866–68, and in 1872 was appointed Minister to Russia, where he died in the following year.

ORRENTE, ôr-rän'tā, **Pedro,** Spanish painter: b. Montealegre, Murcia, about 1560; d. 1644. It is supposed that most of his instruction was had from El Greco, whose friend he was. He devoted himself to Scriptural themes, working at Toledo, Valencia, Cuenca, Madrid, Seville and elsewhere. Orrente belongs to the naturalistic school. His best-known works are 'Departure of the Israelites,' in the Madrid Academy; 'Miracle of Saint Ildefonso,' in Toledo Cathedral; 'John the Baptist,' now in Vienna; and 'The Adoration of the Magi,' in the Prado, Madrid.

ORRERY, ŏr'ē-rĭ, **Earls of.** See BOYLE.

ORRERY, *in astronomy,* a machine for representing the motions of the planetary bodies. Distinct names have been given to various modifications of it: the planetarium, which exhibits the orbital paths of the planets and their satellites; the tellurium, which shows the motions of the earth causing day and night, the seasons, and the variable length of the former as dependent upon the latter; the lunarium, which shows the motions of the moon; and the satellite machine, chiefly intended to represent the motions of Jupiter and his satellites. The ordinary orrery was invented by George Graham about 1700, and first patronized by the Earl of Orrery. Steele, probably supposing the earl to be the first promoter if not the inventor of it, called it by his name. The contrivance is useful rather in aiding the conceptions than in elucidating truths; but it is mischievously faulty owing to the impracticability of representing in model anything like the proportions subsisting among the planetary bodies.

ORRIS ROOT, the rhizome or underground stem of a white-flowered species of iris, *I. florentina,* a native of the south of Europe. In a dried state it is well known on account of its communicating a grateful odor, resembling that of violets. It was formerly much employed in medicine, but is now little valued except as a perfume. It is exported from the Mediterranean in considerable quantities, and, among other uses, is employed in the manufacture of tooth powder. See IRIS.

ORRVILLE, Ohio, village of Wayne County, on the Pittsburgh, Fort Wayne and Chicago, the Cleveland, Akron and Cincinnati and the Wheeling and Lake Erie railroads, 15 miles south of Akron. It contains a wood-preserving factory, mattress works and drill factory. It enjoys local fame as a horse mart. The village owns the water-supply system and the electric-lighting plant. Pop. 3,101.

ORSI, ôr'sē, **Achille d',** Italian sculptor: b. Naples, 1845. He received his training at the Royal Institute of Naples and afterward at Rome. He first attracted general attention by his remarkable work 'The Parasites' at the Naples Exposition of 1877, His 'Proximus Tuus' followed in the same satiric vein against the smug bourgeoisie It is now in the National

Gallery, Rome. There is a statue of Alphonso of Aragon by him at Naples; other works are 'Boy Carrying Water Jars' and 'A Sailor's Head,' perhaps his greatest works.

ORSINI, ôr-sē'nē, Italian noble family dating back to the 8th century. Popes Paul I (757) and Eugene II (824–827) were of this name. In the 11th century the Piedmont branch were prominent among the members of the Guelph party, even opposing Frederick Barbarossa. But the Roman branch is better known, especially for its rivalry with the Colonna family, beginning at the close of the 13th century and standing for the Church as against its rival for the people. The first great name in this branch is Nicholas III, who was Pope from 1277 to 1280. Even in the city of Rome the Orsini built strong fortresses, thanks to the connivance of Eugene IV, one of them covering the site of the Marcellus Theatre. They boldly opposed the attempt of Henry IV to assert his power in Rome, and the most notable part of their struggle with the Ghibelline Colonnas was the mad and unrestrained fighting of 1333–35, which by its abuses paved the way for the brief Roman republic under Cola da Rienzi. The important members of the next centuries were: Virginio: d. 18 Jan. 1497, a famous condottière, who fought for the Pope, then for the king of Naples and finally for Charles VIII; Niccolo, count of Petigliano: b. 1442; d. 1510; head of the Angevin party, and later leader of the Venetians against the League of Cambrai; Vincenzo Maria, who became Pope Benedict XIII in 1724; and Fulvio Orsini (1529–1600), an antiquarian and author of 'Familiæ Romanæ' (1577).

ORSINI, Felice, fā-lē'chā, Italian revolutionist: b. Meldola, December 1819; d. Paris, 13 March 1858. He studied at Imola and Boulogne, took part in several plots against the pontifical government, was condemned to the galleys for life at 25, was pardoned by Pius IX, became a leader of the rising of 1848 and after the fall of the republic engaged in several unsuccessful plots. He was arrested and imprisoned in 1854, escaped to England, where he made a living as a lecturer on the papacy. Hoping that the death of Napoleon III would be followed by a general Italian rising, he made his way to Paris in December 1857, and 14 Jan. 1858, with his two accomplices, threw three bombs at the emperor and empress in the Opéra. Many were killed by the explosions, but Napoleon and Eugenie were unhurt. Orsini was executed with one of his accomplices, the other being pardoned at the empress' request. He was the author of 'Austrian Dungeons in Italy' (1857) and 'Memoirs and Adventures' (1857).

ORSOVA, ŏr'shō-vō, Hungary, a frontier town on both banks of the Cerna at its confluence with the Danube, near the Vaskapu or Iron Gates, 92 miles east of Belgrade. Old Orsova, the Roman Tierna, on the west bank of the Cerna, has a modern harbor, is a station for the Danube steamers and an important railway junction. Pop. about 4,610. New Orsova (pop. about 3,500), on the Rumanian side, is a fortified town held by Austria since 1878, who also were masters of it between 1716 and 1738; the Turks held it both before 1716 and after 1738. In 1890–96 a costly canal and other works were made in order to facilitate navigation at the rocky bend called the Iron Gates.

ÖRSTED, ĕr'stĕd, **Hans Christian,** Danish physicist: b. Rudkjöbing, on the island of Langeland, 14 Aug. 1777; d. Copenhagen, 9 March 1851. He studied from 1794 at Copenhagen University, became (1800) adjunct professor of the medical faculty and started lectures on chemistry. After traveling (1801–03) through Holland, Germany and spending a year in Paris, he was appointed (1806) professor of physics at the Copenhagen University. He was the discoverer of electro-magnetism, as shown in 'Experimenta circa effectum conflictus electrici in acum magneticam' (Copenhagen 1820). In 1824 he founded a society for propagating the science of natural philosophy and became (1829) director of the Copenhagen Polytechnical School. He wrote 'Ideen zu einer neuen Architektonik der Naturmetaphysik' (Berlin 1802); 'Ansicht der chemischen Naturgesetze' (ib. 1812); 'Tentamen nomenclaturæ chemicæ omnibus linguis scandinavo-germanicis communis' (Copenhagen 1814); 'Naturlärens mechaniske Deel' (ib. 1844; 3d ed., 1859); 'Aanden i Naturen' (Copenhagen 1849–50); 'To Capitler af det Skjönnes Naturläre' (Copenhagen 1845). A collective issue, in nine volumes, of his works was published under the title 'Samlede Skrifter' (Copenhagen 1850–51). A bronze statue was erected in Copenhagen in 1876 in honor of the discoverer of electro-magnetism, one of the most revolutionary scientific discoveries of modern days, and the Copley Medal was awarded him by the Royal Society of England. Consult Hauch and Forschhammer, 'Örsteds Leben' (Spandau 1853); Beaumont, Elie de, 'Memoir of Örsted,' Alexander's translation in Smithsonian Institution, Annual Report, 1868 (Washington 1869).

ORTEGA, Juan de, Spanish monk and writer; credited with the authorship of 'Lazarillo de Tormes,' the first of the picaresque or vogue novels, which set the vogue for this type of fiction. The work appeared anonymously but in 1605 José de Ligüenza, a Hieronymite monk, attributed the work to Fray Juan de Ortega. In 1607 Vatere André, and in 1608 André Schott, named Diego Hurtado de Mendoza as the author, and it was not until 1880 that Morel-Fatio discredited the latter statement as untenable. (See Lazarillo de Tormes). Consult Morel-Fatio, A., 'Études sur Espagne' (Paris 1888; 2d ed., 1895); Markham, (Sir) C., 'Life of Lazarillo de Tormes' (London 1908).

ORTEGAL, ŏr'tē-gạl (Sp. ō-tā-gäl'), **Cape.** See Cape Ortegal.

ORTELIUS, ORTEL, or **OERTEL,** ĕr'tĕl, **Abraham,** Flemish geographer: b. Antwerp, 4 April 1527; d. there, January 1598. He was wealthy, traveled in England, France, Germany, Italy and had a wide acquaintance with the geographers of his time. In 1570 he published his 'Theatrum Orbis Terrarum,' a collection of maps with short descriptions of the various countries in Latin. This was long a standard geographical authority in Europe, and there are various editions in Latin, French and German. Several of the maps are of great interest for the early cartography of America.

Ortelius published other geographical works, such as 'Synonymia Geographica' (1578) and 'Itinerarium per Nonnullas Galliæ Belgicæ Partes' (1584). He amassed a museum of coins, antiquities, etc. He was appointed royal geographer by Philip II in 1575.

ORTH, ôrth, **Bertrand,** Canadian Roman Catholic prelate: b. Algert, Rhine Province, Prussia, 5 Dec. 1848. He received a theological education at the American College in Louvain, Belgium, and was ordained in 1872, when he was sent to Oregon as missionary to the Indians. He remained in that position until 1890, when he was appointed United States post chaplain at Camp Harney. In addition to his missionary work he had edited the *Catholic Sentinel* of Portland and taught in various Catholic colleges. In 1900 he was consecrated first bishop of Victoria, Vancouver Island; in 1903 was elevated to the archbishopric and resigned in 1908.

ORTH, Godlove Stoner, American legislator: b. near Lebanon, Pa., 22 April 1817; d. Lafayette, Ind., 16 Dec. 1882. He was graduated from the Pennsylvania College at Gettysburg, admitted to the bar in 1839 and began his law practice in Lafayette, Ind., where he at once interested himself in politics. In 1843–50 he was a member of the State senate, and in 1861 was appointed one of the five commissioners to consider the possibilities of a peaceful solution of the impending troubles. His sympathies were on the Union side, and after a brief term of military service he was elected to Congress and gave support to the policy of Lincoln. He was in the 39th, 40th, 41st, 43d, 46th and 47th Congresses. In 1875 was appointed Minister to Vienna.

ORTHIS, a large genus of palæozoic brachiopods (q.v.), typical of the strophomenaceous family *Orthidæ,* which lived in such abundance and variety from the Ordovician to the Carboniferous periods that they are known from all over the world and the Ordovician and Silurian formations alone have yielded no less than 400 species. American specialists, it should be said, subdivide the genus into a dozen or more subgenera. The orthids have a shell, squarish in outline, with the surface covered with radiating striæ or costæ; the valves more or less convex; the small or dorsal valves, sometimes nearly flat or slightly concave. A distinguishing feature of the genus is that the well-developed hinged area is usually divided by a large, open delthyrium. A deltidium is developed only in younger growth stages. Consult Woods, H., 'Palæontology' (4th ed., Cambridge 1909); Zittel-Eastman, 'Text-book of Palæontology' (1900).

ORTHITE, natural hydrated silicate of aluminum, iron, calcium and cerium, with long, straight prismatic crystals (hence its name), which occur in feldspar. Its formula is $H_2(CaFe)_4(AlC)_6Si_6O_{26}$. Its specific gravity is between 3.37 and 3.8, its hardness between 5 and 6. Orthite occurs in granite, gneiss, syenite and other rocks; usually is of a brownish or yellowish color and contains small quantities of many rare elements, such as lanthanum, yttrium and didymium. It is found in the Urals and in Sweden, Norway, Greenland and the Atlantic States.

ORTHOCERAS, ôr-thŏs'ē-ras, a genus of fossil cephalopods, allied to the nautilus, having straight, tapering, smooth-chambered shells, with the siphuncle central, which occur from the Silurian to the Trias. It forms the type of a family *Orthoceratidæ,* some of the species of which must have been more than six feet long and one foot wide. Related groups had shells curved in various degrees, thus approaching the coiled nautilus form.

ORTHOCLASE, a variety of monoclinic feldspar, called common or potash feldspar, owing its scientific name to the rectangular cleavage of its crystals; it is a silicate of aluminum and potassium, with the general formula $K_2Al_2Si_6O_{16}$; and occasionally has some sodium in place of the potassium. The percentage of silica is usually 65 and of potash about 12. The color is white or green, sometimes rose or yellowish; its specific gravity is 2.53 to 2.59, and its hardness 6. It may be transparent or opaque. It is an essential component of many stones, such as granite, syenite, porphyry, trachyte and gneiss. It is found in larger masses enclosed in granite and other igneous or metamorphic rocks. It is unaffected by acids, save hydrofluoric; but is decomposed by water containing carbonic acid, the alkali being removed and clays being formed.

ORTHOGRAPHY, *in architecture,* the geometrical scheme of an elevation of a building or section thereof; in music, the art of recording effects and tones by the proper conventional characters; in general, the art of setting down words correctly as regards their component letters according to accepted usage. See PHONETICS; SPELLING; SPELLING REFORM.

ORTHOPÆDICS (Greek, ὀρθός, straight, + παῖς, child), a branch of medical science relating to the cure of natural deformities; not, as the name implies, restricted to children, although childhood is usually favorable to treatment. The practice of orthopædics includes prophylactic or preventive treatment and curative treatment. The object of the first is to prevent deformities in children who, from the delicacy of their constitution, are exposed to them. Its means are hygienic; and its aim is to aid by natural means the symmetrical development of the body. Among these means one of the most important is pure air. Children have been known to recover from an incipient deformity of the spine or members merely by being sent to the country. The compressed-air bath has been used with success as an auxiliary in this branch of treatment. Muscular exercise methodically applied is another resource of great importance. It has the advantage not only of developing the muscles, but of aiding digestion and secretion. Treatment by curative orthopædics has been applied with success to a great variety of malformations both of spine and members. The manufacture of apparatus for the mechanical treatment of deformities has become a distinct branch of business, and there are in various countries numerous institutions where such treatment is systematically given. The paralysis incident to an attack of poliomyelitis, or infantile paralysis, yields to protracted treatment of the affected parts, by electric stimulation, manual treatment, exercise, etc.

ORTHOPHOSPHORIC ACID. See Phosphoric Acid.

ORTHOPODA, an order of herbivorous dinosaurs (q.v.), in the classification of Gadow, which includes as subordinate groups the plantigrade *Stegosauri* and the digitigrade *Ornithopoda* of Marsh. The group-characters are anatomical, especially those of the pelvis, which are very bird-like, and of the jaws, the premaxilla having no teeth. Consult Gadow, 'Amphibia and Reptiles' (1901).

ORTHOPTERA, or straight-winged insects, one of the Linnæan orders of *Hexapoda,* which has undergone least change in the hands of modern systematists. The three regions of the body are distinct; the head is large with strong, biting jaws, and long or short filiform antennæ; the prothorax is usually greatly developed, and may form a shield partly covering the mesothorax; and the abdomen is usually full and terminated by a pair of claspers in the male and a more or less prominent ovipositor in the female. The anterior pair of wings are of little use in flight, but they are thickened and serve as covers to protect the broad, membranous, netted-veined hind wings, which, when not in use, are folded longitudinally like fans and concealed beneath the covers. In some genera wings are absent. Being of terrestrial habits and seldom flying far, the legs are well developed for running, leaping, or, as in the mole-crickets, for burrowing. There is a gradual change without any sudden metamorphosis from the larva to the imago, the pupa being active and differing from the adult only in the undeveloped wings and reproductive organs; nor do the larvæ differ greatly in appearance. The eggs are usually laid on the ground and sometimes, as with the grasshoppers, in nests or cells. With the striking exception of the mantids, almost all of the species are strictly herbivorous and among them are some of the most serious pests with which the husbandman has to contend. One characteristic of this group is the presence of sound-producing structures, by means of which, in some families by rubbing, in others by concussion, or by a combination of both methods, are produced the noises familiar to use as the «chirping» of crickets, the «calling» of katydids, «whirring» of grasshopper (qq.v.), etc. Examples of how much sounds are made are furnished by the locusts and grasshoppers, which produce sounds in several ways. The *Acridiidæ* rub the inner surface of the hind Femora, upon which there is a row of minute spines, against the outer surface of the fore wing. In this case each fore wing serves as a fiddle and each hind leg as a fiddle-bow. The *Locustidæ* and *Grydillidæ* rub together the upper surface of the front edge of the hind wings and the under surface of the fore wings. This is done while the locust is flying, and the result is a crackling sound. The *Acridiidæ* have auditory organs on the sides of their abdomens, while the «ears» of the *Locustidæ* and *Gryllidæ* are on the front legs. This consists of a peculiar arrangement of the veins and cells of a portion of each fore wing near its base. This arrangement differs in the different species, but in each it is such that by rubbing the fore wings together they are made to vibrate, and thus produce the sound. The principal families are the *Forficulidæ* or earwigs, the blind *Hemimeridæ,* the *Blattidæ,* or roaches, the *Phasmidæ,* or walking-sticks, the *Mantidæ,* or praying insects, the *Gryllidæ,* or crickets and mole-crickets, the *Locustidæ,* or green grasshoppers, and the *Acridiidæ,* or locusts, all of which are elsewhere described. Consult the 'Text-books' of Comstock, Packard, Carpenter and others; and Howard, 'The Insect-book' (1901), which contains an extensive bibliography of the group.

ORTLER-SPITZE, ŏrt'lĕr-spĭt'sĕ, or **ORTLER,** Austria, a mountain in the Tyrol, on the borders of the Engadin, 70 miles southwest of Innsbruck. It is about 12,802 feet high, and the loftiest peak in Austria. The summit commanding one of the most extensive views in the Rhætian Alps was long considered inaccessible and was first ascended in 1804.

ORTMANN, Arnold Edward, American Palæontologist: b. Magdeburg, Prussia, 8 April 1863. He studied at the universities of Jena, Kiel and Strassburg, gaining the Ph.D. diploma at Jena in 1885. After doing military service in Germany he was sent to Zanzibar, Africa (1890–91), in search of natural history specimens. He came to the United States in 1894, was made curator of invertebrate palæontology (1894–1903) at Princeton, and became (1903–) curator of invertebrate zoology at Carnegie Museum, Pittsburgh. He was professor of physical geography at the University of Pittsburgh from 1910. In 1911 he was given the degree Sc.D. by the University of Pittsburgh. He was a member of the Princeton Arctic Expedition in 1899. He has written among numerous other works 'Grundzüge der Marinen Tiergeographie' (1886); *Continuation of Die Decapodon* in Bronn's *Klassen und Ordnungen des Tierreiche's* (1898–1900); 'Tertiary Invertebrates of the Princeton Expedition to Patagonia' (1902). Besides being associate editor of the *American Naturalist* he has written many articles for the periodicals.

ORTOLAN, a European yellowish-brown bunting (*Emberiza hortulana*) famous as a dainty. It is migratory, spreading over northern Europe in summer to breed, and making its nest in bushes or small trees, and singing pleasantly. Toward autumn, when it begins to migrate southward, it is plump and regarded as excellent eating. These birds are caught in great numbers at that season along the shores of Italy and the eastern Mediterranean, and are kept in confinement and fed for some time until they become exceedingly fat and delicate, and form a table luxury. The favorite method of preparing the ortolans for table consists in roasting them in egg shells — a mode of cookery borrowed from the ancients, among whom these birds brought very high prices. In former times the island of Cyprus formed a chief depot for the exportation of these birds, which were pickled in spices and vinegar and packed in casks containing from 300 to 400 each. From 400 to 500 casks are annually exported from Cyprus.

ORTON, ôr'tŏn, **Edward,** American educator and geologist: b. Deposit, N. Y., 9 March 1829; d. Columbus, Ohio, 16 Oct. 1899. He was graduated from Hamilton College in 1848, and later studied at Andover and at Harvard and entered the ministry. In 1856 he took the chair of natural science at the Albany State Normal School, from 1859 to 1865 he was principal of the preparatory academy of Chester, Orange County, N. Y., accepting in the latter year the chair of natural science at Antioch College, Yellow Springs, Ohio, where in 1872 he was elected president. In 1873 he was called to the presidency of the newly-founded Ohio State Agricultural and Mechanical College, which has since become the Ohio State University. His university work was of great value, as he was a natural teacher and organizer in addition to his scholastic attainments. He was assistant on the geological survey of Ohio in 1869–77, and in 1882 was appointed State geologist, which position he filled until his death, and he frequently served on, and wrote sections of the reports for, the United States geological surveys. He resigned his presidency of the college in 1881, but continued to fill the chair of geology during his life. In 1896 he was president of the Geological Society of America. Among his works are 'Economic Geology of Ohio' (1883–88); 'Petroleum and Inflammable Gas' (1887), etc.

ORTON, Edward, Jr., American industrial chemist: b. Chester, N. Y., 8 Oct. 1863. He received (1884) the degree E.M. at Ohio State University and became (1884–88) chemist and superintendent of blast furnaces. The regular manufacture of high silicon alloy of iron, "ferro-silicon," in the United States was introduced first by him, at the Bessie Furnace, New Straitsville, Ohio, 1887–88. In the latter year he entered the ceramic industries of Ohio, managing several plants till 1893. He was the first to start the agitation (1893) that brought into being (1894) the first United States school for teaching the technology of the clay, glass and cement industries and he was director till 1916. From 1902–06 and from 1910–16 he was dean of the College of Engineering of Ohio State University, and from 1899–1906 he was State geologist of Ohio. He has written 'Clays of Ohio and the Industries Established Upon Them' in *Ohio Geological Survey*, Vol. V (1884); 'The Progress of the Ceramic Industry' (1903), besides a number of technical articles and reports published in the periodicals.

ORTON, James, American Congregational clergyman, naturalist and traveler: b. Seneca Falls, N. Y., 21 April 1830; d. on Lake Titicaca, Peru, 25 Sept. 1877. He was graduated from Williams College in 1855, pursued theological studies at Andover and entered the ministry in 1860. He was professor of natural science in Rochester University in 1866, and the next year conducted an exploring party of students across South America, on the geology and physical history of which he was an authority. He was professor of natural history in Vassar College 1869–73, and at the time of his death was attached to an exploring expedition in Peru. His works include 'The Andes and the Amazon' (1870); 'Underground Treasures' (1872); 'Liberal Education of Women' (1873); 'Comparative Zoology' (1875).

ORTYGAN. See BUTTON-QUAIL.

ORURO, ō-roo'rō, Bolivia, a department lying in the western part, bounded on the west by Chile, on the south by the department of Potosi and on the north by the department of La Paz; area, 21,350 square miles. It is the smallest of the departments of Bolivia. The Andes Mountains follow the western boundary, and the Cordillera Real the eastern; the department lies in the Titicaca Basin. The surface is mostly an elevated plateau, rarely sinking below the level of 12,000 feet; the salt lake of Allugas is situated in the eastern part. There are numerous marshes and saline plains, the soil in general is unfitted for agriculture and the climate is cold. There is considerable mineral wealth, particularly in tin, silver and copper, and mining is the chief and most profitable industry; cattle are also raised in some sections. Pop. about 145,000, of which a considerable portion are Indians.

ORURO, Bolivia, city, capital of the department of Oruro, within four miles to the east of the Desaguadero River, 125 miles southeast of La Paz. It is on a plain over 12,000 feet above sea-level, about 10 miles north of Lake Allugas. It was founded in 1590, and during the 17th century was very prosperous, owing to the mines in the vicinity, having at that time over 70,000 inhabitants. Later the mines were abandoned, the population declined rapidly and a portion of the city fell into ruins. During the last decade of the 19th century, a railroad connecting it with Antofagasta, Chile, has been the means of reviving its prosperity to a certain extent. Tin is mined in the vicinity, and considerable quantities of tin, as well as copper and silver, are exported. Pop. 25,000.

ORVIETO, ôr-vē-ā'tō, Italy, a city and episcopal see in the province of Peruggia, Umbria, 78 miles by rail northwest of Rome. It is built on an isolated tufa rock, 1,327 feet above sea-level, and 765 feet above the junction of the Paglia and Chiana, is surrounded by mediæval walls and is reached from the railroad depot by a funicular or inclined railway. The cruciform cathedral (1290–1580), one of the most beautiful and richly adorned specimens of Italian Gothic, is built of black and white marble, and measures 295 feet by 109. The façade is unsurpassed in richness of material and in the beauty of its mosaics, sculptures and elaborate ornamentation. The interior also is magnificently decorated with sculptures and with paintings by Luca Signorelli, Fra Angelico and other noted Italian artists. Two other churches of the 11th century, the bishop's palace, the Jesuit College, Saint Patrick's Well (1527–40), with its 250 steps, and the palaces Petrungeli and Gualtieri deserve special notice, the former for its fine collection of paintings and the latter for its cartoons by Domenichino, Annibale Caracci and other eminent masters. Orvieto, called in the 7th century A.D. Urbs Vetus, of which its present name is a corruption, is supposed to occupy the site of the Etruscan Volsinii. It was created an episcopal see in 509 A.D., and in the Middle Ages it gave shelter to 32 popes; the papal palace, converted into a municipal museum in 1898, has numerous interesting local antiquities, including the contents of an Etruscan necropolis discovered on the east side of the town in 1874. The chief trade of the city is in cattle, grain, wine, oil and silk. Pop. with suburbs about 20,000.

ORYX, ō'rĭks, a genus of antelopes represented by the addax, Beatrix antelope, beisa and other species, found chiefly in northern Africa.

The gemsbok of southern and central Africa is another ally. These antelopes are of comparatively large size. The horns are very long, curved and ringed. These form powerful and effective weapons for defense, and a wounded oryx is a dangerous animal for a man to approach. Their desert habitat is indicated by the prevalent reddish-white uniform tint of their coats, almost the only distinguishing color-marks being upon the face. These antelopes are now greatly reduced in numbers, and some of the northern species are nearly extinct. One or another species is often depicted upon the monuments and mural paintings of ancient Egypt, most frequently, probably, the beisa (q.v.). The species most generally known as the oryx is *O. leucoryx*.

OS, Gregorius Jacobus Johannes van, Dutch painter: b. The Hague, 20 Nov. 1782; d. Paris, France, 11 July 1861. After taking a prize at Amsterdam (1809) and being awarded a gold medal at Paris (1812) he accepted employment as a designer and enamel painter at the porcelain manufactory at Sevres. He was eminently successful in the portrayal of flowers, fruit and other still-life, but he also produced several landscapes. He was known among his French admirers as the «Rubens of flower painting.» So great was his scientific accuracy in drawing plants that he was engaged to furnish most of the illustrations in the ‹Flora Batava.›

OS, Jan van, Dutch painter (father of the preceding): b. Middelharnis, Holland, 1744; d. The Hague, 1808. His studio was at The Hague throughout his artistic career; here he was director of the Académie des Belles Lettres, being a poet as well as a painter of flowers, fruits, landscapes, marines and animals. His flowers are inferior to those of Van Huysum, whom he made his model, but his works are to be found in all important collections, and a picture of his entitled ‹Flowers in a Vase, with a Cat on the Table› sold in 1883 for $1,217.

OS, Pieter Gerardus Van, Dutch painter, son of the preceding: b. The Hague, 1776; d. there, 1839. Although he was trained in art by his father, the flower painter, he made Paul Potter his model, and painted many famous landscapes with cattle in the foreground, and his works were eagerly sought by connoisseurs from all parts of Europe. After serving in the campaign of 1813–14 he produced several battle scenes, some of which are in the Museum at Amsterdam. He was also an excellent etcher.

OSAGE, ō'sāj, Iowa, city and county-seat of Mitchell County, on the Red Cedar River and on the Great Western and the Illinois Central railroads, about 95 miles in direct line northeast of Fort Dodge. It is the commercial and industrial centre of a large productive agricultural region in which there are extensive dairy, nursery and stock-raising industries. It is the seat of the Cedar Valley Seminary, and it has the Sage Public Library. The city owns and operates the waterworks. Pop. 2,432.

OSAGE, a river which has its rise in the prairies of eastern Kansas and enters the State of Missouri at Bates County, flows east and northeast, joins the Missouri River about 10 miles below Jefferson City and has a basin of 15,000 square miles. It is about 495 miles long, and navigable, part of the year, 200 miles from the Missouri. It is a winding stream with many deep curves of nearly parrallel sides. It is known in Kansas as the Marias des Cygnes.

OSAGE ORANGE (*Toxylon pomiferum* or *Machura pomifera*), a tree of the order of *Urticaceæ*, growing wild in the southwestern parts of the United States. It was first found near a village of the Osage Indians, which fact, connected with the globular form and golden color of its fruit, originated its popular name, but it has no botanical relationship to the true orange. The Osage orange, also called «bowwood» (by French-American writers bois d'arc) and «yellowwood,» is a striking and beautiful lactescent tree, growing 30 or 40 feet high; its foliage is not unlike that of the orange tree, but more glossy and polished and of a bright green color. Its branches spread widely into a broad head; its flowers are diœcious, small, pale yellowish green; the barren are about 12 in number, borne in a very short, almost sessile, racemose panicle. The fruit has about the size and appearance of a large orange, yellow when ripe and roughened on the outside, containing a mucilaginous fluid, insipid and uneatable. The sap of the young wood and leaves is milky, and contains a large proportion of caoutchouc; the color of the wood is a bright yellow; its grain is fine and elastic, on account of which property it is employed by the southern Indians for bows. The young branches, beset with sharp, straight thorns, have suggested the employment of the tree for making live hedges, which succeed admirably where the winters are not so severe as to kill the annual growth. Treated as a hedge plant, it has many excellent characters but in order to form a compact growth, two shearings in a season are requisite. It is easily cultivated and propagated, and pieces of the root planted out in the nursery, with the tips just exposed above the earth, will readily grow; seeds procured from fertile trees may be sown in broad drills, a quart of seed producing at least 5,000 plants. The bark affords a strong fibre of a flaxy character and the bark of the root is used by the country-people of the Southern States as the material for a yellow dye.

OSAGES. A French corruption of «Wazhazhe,» their proper name, a tribe of North American Indians of Siouan origin, now as the Osage Nation occupying a reservation in northeast Oklahoma on the east bank of the Arkansas River. In the 17th century they were living in an extensive region between the Arkansas and Missouri rivers, and were early allies of the French, distrusted by, and in frequent warfare with, the neighboring Cherokee, Chickasaw, Creek, Choctaw and other Indians. The first historical notice of the Osage comes from Marquette (1673) who places them on the Osage River, where they remained until their removal in the 19th century farther westward. In 1714 the Osages formed an alliance with the French against the Foxes, who were badly defeated at Detroit. From this time on they appear to have been at almost constant war with the surrounding tribes in some of whom their very name inspired terror. At the beginning of the 19th century nearly half of the Great Osage, under Big-track, migrated to the Arkansas River district. In 1804 the Arkansas Osage were estimated to number about 600, the part of the tribe left behind on the Osage River about the same number; and the little Osage somewhat less. But Morse, in 1821, Porter in 1829, the United States Indian Office in 1843, all estimated the Osages as from 4,000 to 5,000. In 1906, after the division of the tribal land and trust fund provision, there were still about 2,000 Osages under the care of the Indian Office. By a treaty between the United States and the Osage Nation, the latter in 1808 conceded to the former all their lands east of a line running south from Fort Clark to the Arkansas River, and those west of the Missouri River, comprising the present State of Missouri and the northern part of Arkansas. Again in 1825, in 1839 and 1865 their territory was gradually reduced and finally confined to their present reservation by act of Congress in 1870. The Osage Nation is said to be the richest community in the world. They own nearly 1,500,000 acres of land, worth not less than $10 an acre. Besides this they have in the United States treasury $8,562,690 derived since 1808, mainly from the judicious sale of superfluous lands. By Act of 28 June 1906 an equal division of the lands and the funds of the Osage was provided for.

OSAKA, ō-sä'kä, or **OZAKA**, Japan, the second largest city of the empire, and one of the three imperial cities, on the island of Hondo, at the mouth of the Yodo in the Gulf of Osaka, 20 miles by rail southeast of Kobe, and 27 miles southwest of Kioto. It is the least picturesque of Japanese cities, but is the foremost commercial mart of the entire Orient. The city covering an area of 27 square miles lies upon either bank of the river Yodo and upon an island in the middle of the river; the many intersecting canals and the bridges (over 1,000) spanning these give the Venetian effect. The rich business and manufacturing section is on the south bank of the river, and the western quarter is monopolized by the shipping interests. The island in the midst, which is the heart of the city, bears the poetical name of Nakanoshima, while anciently Osaka itself was known as Naniwa, meaning «dashing waves.»

In the upper town, the fine castle, the granite of its walls of astonishing size, was constructed by Hideyoshi's orders in 1583. In its construction between 30,000 and 60,000 laborers were employed night and day for three years. The palace, built afterward in its precincts and destroyed in the civil war of 1868, was perhaps the most magnificent structure in Japan. Another notable edifice is the Sumiyoshi temple founded by the consort of the 14th emperor. Among modern buildings are the Mint, the central post office and the new Bank of Japan, a most imposing edifice. The fine modern harbor protected by a mole has a depth of 28 feet at low water, and hundreds of steamers and sailing craft ply between its wharves and the ports of Formosa, Korea and China. Osaka is the headquarters of the Osaka Chosen Kaisha line. There is an excellent street railway system, and a belt line half encircles the city. Cotton spinning is the principal of its numerous manufacturing industries; three-fourths of the operatives are women and girls; other important manufactures are those of iron and steel products, glass, boots and shoes, bricks, chemicals, matches, tobacco and clocks; shipbuilding is also a considerable industry. The foreign settlement is on the deltaic island of Kawaguchi. Osaka was opened to foreign trade and residence in 1868. Destructive fires visited the city in 1910 and 1912. Pop. 1,273,658.

OSCAR. See Esker.

OSAWATOMIE, ŏs-ą-wŏt'ō-mē, Kan., city in Miami County near the Osage and Pottawatomie rivers, and on the Missouri Pacific Railroad, 60 miles southwest of Kansas City, Mo. Its name comes from the two rivers mentioned. It is in a stock-raising and agricultural section, and in a natural gas belt. A few settlers were in this section about 1850, but in 1855 the place was organized by the Emigrant Aid Society as a «free-State settlement John Brown (q.v.) was interested in this settlement, and for a time lived on a farm nearby. On 30 Aug. 1856 the town was attacked by a band of pro-slavery sympathizers; John Brown and his friends made a vigorous resistance, but were finally overcome. A monument has been erected in commemoration of this event and there is a park known as the John Brown Memorial Park. The city is the division headquarters for the Missouri Pacific Railroad, and has the railroad shops, machine shops, flour mills and large stock yards. It is the seat of the State Insane Hospital opened in 1866, which has over 1,000 patients each year. Some of the prominent buildings are the city library, city hall, the Agnew Opera House, a Masonic temple, the churches and schools. The city adopted the commission form of government in 1914. It owns and operates the sewage, water and electric-lighting plants. Pop. 4,400.

OSBORN, Bradley S., American naval officer: b. Rye, N. Y., 16 Aug. 1828; d. 6 May 1912. He went to sea at 10, and served in the Chinese navy as coxswain, in the Argentine navy as commander, and was an admiral in the Mexican navy. In the Civil War he served under Du Pont, Worden and Farragut, receiving honorable mention by the latter. As volunteer naval scout in the Spanish-American War he was the first to discover the proximity of Cervera's fleet off Curaçoa, 14 May 1898, for which he received the thanks of the government. He served in the Arctic and Antarctic oceans and in 1900 he became flag-officer commanding the United States Veteran Navy with the rank of commodore. He published 'Osbon's Hand Book United States Navy' (1864); and 'United States Veteran Navy List' (1900).

OSBORN, Henry Fairfield, American palæontologist: b. Fairfield, Conn., 8 Aug. 1857. He graduated from Princeton University in 1877 and in 1880 was assistant professor of anatomy there; from 1891–1910 was professor of zoology at Columbia University and on 4 Dec. 1906 was elected secretary of Smithsonian Institution, but declined the office. He was vice-president of the American Museum of Natural History (1901–08); trustee, 1901; and president since 1908. He explored for fossil vertebrates in western United States from 1891; in Fayum desert, Egypt, 1907; was active in founding New York Zoological Park under auspices New York Zoological Society as chairman executive committee (1896–1903, 1907–08); vice-president 1897–1909; president since 1909. Since

1900 he has been palæontologist of the United States Geological Survey. He has published ‘From the Greeks to Darwin’ (1894); ‘Evolution of Mammalian Molar Teeth’ (1907); ‘The Age of Mammals’ (1910); ‘Men of the Old Stone Age’ (1915); over 400 scientific papers, addresses and memoirs on zoology, vertebrate palæontology, comparative anatomy, embryology, zoogeography, anthropology, evolution, etc.

OSBORN, Herbert, biologist, entomologist and teacher: b. Lafayette, Wis., 19 March 1856. He was educated at Iowa State College and occupied positions from assistant to professor of zoology and entomology there 1880–98. Since July 1898 he has been State entomologist of Iowa, and professor of zoology and entomology at the Ohio State University. Among his professional writings are ‘Pediculi and Mallophaga of Man and Domestic Animals’ (1891); ‘Insects Affecting Domestic Animals’ (1896); ‘The Hessian Fly in the United States’ (1898); ‘The Genus Scaphoideus’ (1900); and many articles in scientific journals and proceedings.

OSBORN, Sherard, English author and navigator: b. Madras, India, 25 April 1822; d. London, England, 6 May 1875. He entered the navy in 1837 and was ordered to the East Indies, where at 17 he commanded a ship in the blockade of Quedah. In 1849 and in 1852–55 he was in command of one of the ships in the expeditions of Austin and Belcher sent in search of Sir John Franklin. He served in the Crimean War; in China, and Japan in 1857–59; and in 1862 commanded a squadron for the suppression of piracy. He was made rear-admiral in 1873. He wrote ‘Stray Leaves from an Arctic Journal’ (1852); ‘Quedah: Stray Leaves from a Journal in Malayan Waters’ (1857); ‘The Career, Last Voyage, and Fate of Sir John Franklin’ (3 vols., 1860); ‘The Past and Future of British Relations in China,’ etc.

OSBORN, Thomas Ogden, American lawyer: b. Jersey, Ohio, 1832; d. Washington, D. C., 27 March 1904. He was graduated from the Ohio State University in 1854 and then studied law. At the outbreak of the Civil War he organized and became colonel of the 39th Illinois Volunteers; commanded four regiments at the capture of Fort Sumter, and rose to the rank of major-general of volunteers. He returned to his practice after the war, was treasurer of Cook County, Ill., and manager of the National Soldiers' Home; he served as member of the commission appointed to settle disputed claims between United States and Mexico, and in 1874–85 was United States Minister to Argentina.

OSBORNE, Dorothy, English letter writer: b. 1627; d. 1699. She was the daughter of Sir Peter Osborne and married Sir William Temple in 1655. Her husband's schemes are said to have been aided by her and she was a friend of Queen Mary II. But it is in her letters, written to Temple during her prolonged engagement while her parents were delaying her marriage, that the world's interest in her centres. These letters to her fiancé form a superlative correspondence which is universally admired, and the few that appeared appended to Courteney's ‘Life of Temple’ called forth Macaulay's high praise. A fuller collection of these delightful letters was edited and published (London 1888) by E. A. Parry under the title of ‘The Love Letters of Dorothy Osborne,’ a later edition appeared in New York in 1901, and in *Everyman's Library*. The charm of this 17th century correspondence retains its freshness to this day.

OSBORNE, John E., American public official: b. Westport, N. Y., 19 June 1864. He received a high school education and at the age of 16 was apprenticed to a druggist in Vermont. Subsequently he was graduated in medicine at the University of Vermont. He removed to Rawlins, Wyo., was appointed assistant surgeon of the Union Pacific Railway, established a wholesale and retail drug establishment in 1882 and since 1884 has been engaged in raising livestock. He served one term as member of the Wyoming territorial legislature and in 1888 was chairman of the territorial penitentiary commission. In the same year he was elected mayor of Rawlins, and from 1893 to 1897 was governor of Wyoming. He was delegate to the Democratic National Convention of 1896 and served as member of the 55th Congress in 1897–99. In the latter year he was Democratic candidate for United States senator in the Wyoming legislature. Since 1912 he has been a member of the Democratic National Committee. On 21 April 1913 Mr. Osborne was appointed First Assistant Secretary of State, from which post he resigned 14 Dec. 1916. He was a candidate for the United States Senate at the November elections of 1918.

OSBORNE, Oliver Thomas, American physician: b. New Haven, Conn., 14 Nov. 1862. He received (1884) his M.D. degree at Yale and that of A.M. in 1900. He did post-graduate work (1885) at Leipzig, and (1886) he started to practise medicine at New Haven. He was made professor of therapeutics at Yale Medical School in 1911, then professor of materia medica, therapeutics and clinical medicine. He has been chairman of the medical board of Gaylord Farm Tuberculosis Sanatorium. From 1908 he has been editor of the therapeutic section of the *Journal of the American Association*. He was a member of the revision committee of the United States Pharmacopœia. He has written ‘Diphtheria’ (1890); ‘Therapeutic Uses of Organic Extracts’ (1902); ‘Introduction to Materia Medica and Pharmacology’ (1906); ‘Mixtures of the United States Pharmacopæia’ (1913); ‘The Prevention and Treatment of Infections’ (1915).

OSBORNE, (Samuel) Duffield, American author: b. Brooklyn, N. Y., 20 June 1858. He was graduated at the Brooklyn Polytechnic Institute in 1875; at Columbia in 1879; Columbia Law School in 1881; received the degree of A.M. from Columbia in 1882, and practised law in New York 1881–92. He was assistant secretary and, later, acting secretary of the Brooklyn department of city works in 1893–94, and spent much of the following years in travel and archæological research in Italy, Sicily and Tunis. He has published ‘The Spell of Ashtaroth’ (1888); ‘The Robe of Nessus’ (1890); ‘The Secret of the Crater’ (1900); ‘The Lion's Brood’ (1902); ‘The Angels of Messer Ercole’ (1907); ‘Engraved Gems: Signets, Talismans and Ornamental Intaglios ancient and modern’ (1912); also many short stories, essays, poems and archæological papers in periodicals.

OSBORNE HOUSE, a large English villa, formerly the residence of Queen Victoria, situated near East Cowes in the Isle of Wight and where she died, 22 Jan. 1901. Edward VII, to whom it was left, presented it to the nation. Part of it is used as a convalescent home for officers of the army and navy, and part as a naval college.

OSBOURNE, Lloyd, American author: b. San Francisco, Cal., 7 April 1868. He was educated at Edinburgh University, traveled extensively and, accompanying his step-father, Robert Louis Stevenson, to Samoa, was at one time United States consul there. He wrote in collaboration with Stevenson 'The Wrong Box' (1889); 'The Wrecker' (1892); and 'The Ebb Tide' (1894). Among his own works are 'The Renegade'; 'The Queen vs. Billy' (1900); 'The Motor-Maniacs' (1902); 'Three Speeds Forward' (1906); 'The Adventurer' (1907); 'Infatuation' (1909); 'The Kingdoms of the World' (1911); 'A Person of Some Importance' (1913), and in conjunction with Austin Strong, two plays.

OSCANS. See OSCI.

OSCAR I (JOSEPH FRANÇOIS BERNADOTTE), king of Sweden and Norway: b. Paris, 4 July 1799; d. 8 July 1859. He was educated at the Lycée Louis le Grand and after his father had been chosen Prince-Royal of Sweden (see BERNADOTTE) he joined him in that country, and was proclaimed Duke of Sudermania. During the reign of his father he was three times, in 1824, 1828 and 1833, viceroy of Norway, where he made himself popular by his good administration. He afterward continued to study in retirement until the death of his father (4 March 1844) the social and political questions of the day. Parliamentary reform, Jewish emancipation, the freedom of the press and great economic development, were notes of his reign. He resigned the government in 1857 to his eldest son (afterward Karl XV). He wrote several works on political subjects, one of which, 'On Penal Laws and Establishments for Repression,' has been translated into French and German. He also composed an opera, and various other pieces of music. Oscar II (q.v.) was his third son.

OSCAR II, king of Sweden and Norway up to 1905, after that of Sweden: b. Stockholm, 21 Jan. 1829; d. there, 8 Dec. 1907. He was a grandson of Napoleon I's famous general, Marshal Bernadotte, king of Sweden. He was trained in the navy and at the University of Upsala, and ascended the throne in 1872, in succession to his brother, Charles XV. That the severance of the union between Sweden and Norway in 1905 was peaceful was in no small way due to the tact of King Oscar, and he declined to permit any prince of his house to be a candidate for the throne of Norway. He was recognized as a talented sovereign, speaking at least 10 languages, being well versed in naval and military history and general literature, and winning laurels as critic and poet. Among his writings are 'Some Contributions to the Military History of Sweden 1711-13' (1859-65); 'Memories of the Swedish Fleet' (1858), and translations from the German of Goethe's 'Tasso' and Herder's 'Cid.' He was elected an honorary member of the Berlin Academy and of the Imperial Society of Naturalists of Moscow. His collected works appeared in 1875-90. They were rendered into German by Jonas (verse 1877, 1888; prose 1891).

OSCEOLA, ŏs-ẹ-ō'lạ, or **AS-SE-HE-HOLAR,** that is, "Black Drink," Seminole chief: b. near the Chattahoochee River, Ga., 1804; d. Fort Moultrie, S. C., 30 Jan. 1838. His paternal grandfather was a Scotchman. After his father's death his mother married a white man named William Powell, from which circumstance he has been mistakenly regarded as a half-breed under that surname. He was not a chief by descent or even by formal election, but he early manifested qualities of leadership. He showed his boldness in opposing the cession of the Seminole lands in Florida. But his passive opposition was roused in 1835 to open hostility; his wife, the daughter of a fugitive slave, was seized and carried into slavery; in his anger Osceola threatened the Indian agent, General Thompson, so rudely that he was seized, imprisoned and kept in irons for six days. Osceola precipitated the second Seminole War by massacring Thompson and four others a few months later, 28 Dec. 1835. His men who had killed Major Dade and his 110 soldiers on the same day were unsuccessful (31 December) in a fight with Clinch, but they took refuge in the Everglades, emerging now and again, as in the assaults on Micanopy and Fort Drane, never winning a battle, but always led with great skill and daring, and keeping the country in terror. Two years after, October 1837, he was seized by Gen. Thomas Jesup, with whom he was conferring under a flag of truce, and who excused his treachery by Osceola's alleged disregard of treaties. With several followers he was imprisoned at Saint Augustine, and then at Fort Moultrie, where broken in spirit by the betrayal, he died in a few months.

OSCEOLA'S REBELLION. See SEMINOLE WAR.

OSCI, or OSCANS (Greek, *Opikoi*), an Italian people who appear to have been the original occupants, at the earliest known period, of central Italy from Campania and the borders of Latium to the Adriatic. The Oscans were subdued by the Sabines, a people from the Apennines on the north, of whose previous history little is known and who probably adopted the language and customs of the conquered, with what modifications cannot be ascertained. The Oscan language was closely allied to the Latin, of which it was probably a parent stock. It appears to have been spoken in the provinces long after Latin became the official language and it was used officially long after the Roman conquest.

OSCILLATING CURRENT. See ELECTRICAL TERMS.

OSCILLOGRAPH, a form of D'Arsonvel galvanometer, having a reflecting mirror, in which the moving parts are so light and the range of movement so small that the rapid variations in alternating and pulsating currents are easily followed by the ray of light reflected from the mirror. By reason of the persistence of vision, the rapidly moving spot of light actually appears to the eye as a complete curve of current or pressure from an alternating current dynamo. Consult Robinson, L. T., 'The Oscillograph and Its Uses' (in Transactions of the American Institute of Electrical Engineers, Vol. XXIV, New York 1905).

OSCINES, ŏs'ĭ-nēz, a group of passerine birds possessing highly developed vocal organs, and including most of the "singing-birds" of the world. See ORNITHOLOGY.

OSCOTT (ŏs'kŏt) **COLLEGE,** near Birmingham, England, a Roman Catholic institution founded in 1752 as a college and seminary for priests. It played a considerable part in the education of English Catholics when they were yet excluded from the English universities. The school is also called Saint Mary's Seminary. The courses in secular subjects qualify for the degree of B.A. in the London University.

OSCURA MOUNTAINS. A range in the southeastern part of Socorro County, N. Mex. It rises out of the wide desert east of the Rio Grande, presenting to the west a very steep front, 3,000 feet high, of rugged granite slopes surmounted by cliffs of east-dipping limestone which constitutes the summit and east slope. The length of the range is about 20 miles. Highest summit is Oscura Peak, altitude 8,732 feet. Profitable mines of silver lead occur at the north end of the range and the abandoned copper camp of Estey is on its southeastern slope.

OSEL, ē'zĕl, or **OESEL,** Russia, an island of the government of Livonia, in the mouth of the Gulf of Riga and after Seeland the largest island in the Baltic. It is 45 miles long; area, 1,010 square miles. The principal town, Arensburg (pop. 5,000), is on the southeast coast. The coast is generally bold and the interior undulating. The soil, gravelly and not naturally rich, becomes productive by careful culture, and raises corn for export, hemp and flax. The pastures are good, the forests large, the fisheries valuable and its breed of ponies is celebrated. Pop. 66,000, chiefly Esthonian. Successively in the hands of Danes, Swedes and (1721) Russians, it was captured in 1918 by the Germans during the Great War.

OSGOOD, ŏz'gụd, **Samuel,** American soldier and legislator: b. Andover, Mass., 14 Feb. 1748; d. New York, 12 Aug. 1813. He was graduated from Harvard in 1770, engaged in a mercantile career, but public affairs absorbed much of his attention, and in 1775 he was a captain of minute-men at Lexington. For a time he acted as aide to Gen. Artemus Ward, but in 1780 entered the Continental Congress, where he served until 1784. In 1785–89 he was commissioner of the United States Treasury, the first to occupy that office; and in 1789–91, Postmaster-General. Later he was speaker of the New York assembly and in 1801–03 supervisor in New York. From 1803–13 he was naval officer at the port of New York.

OSGOOD, Samuel, American clergyman and author: b. Charlestown, Mass., 30 Aug. 1812; d. New York, 14 April 1880. Graduated from Harvard in 1832, and from the Cambridge Divinity School in 1835, he was later editor at Louisville (Ky.) of the *Western Messenger,* was pastor of a Unitarian church at Nashua, N. H., in 1837–41, and of the Westminster Church, Providence (R. I.), in 1841–49. From 1849 until his resignation in 1869 he was pastor of the Unitarian Church of the Messiah, New York. In 1870 he took orders in the Protestant Episcopal Church. Among his publications were 'Studies in Christian Biography' (1851); 'God with Men' (1853); 'American Leaves' (1867).

OSGOOD, William Fogg, American mathematician: b. Boston, 10 March 1864. He was graduated (1886) at Harvard and studied (1887–89) at the University of Göttingen, then (1890) at Erlangen. He was appointed instructor of mathematics (1890–93), then assistant professor of mathematics (1893–1903) and since 1903 professor at Harvard. From 1899–1902 he was editor of *Annals of Mathematics* and (1909–10) of *Transactions of the American Mathematical Society,* being president of the latter society 1904–05. He has written 'Introduction to Infinite Series' (3d ed., 1906); 'Lehrbuch der Funktionen-theorie' (1905–07); 'First Course in Differential and Integral Calculus' (1907); 'Madison Colloquium Lectures' (1914), besides numerous monographs published in the mathematical journals.

OSGOODE, William, Canadian jurist: b. England, 1754; d. 1824. He was educated at Christ College, Oxford. After a brilliant course in law he was called to the bar and in 1792 removed to Upper Canada, where he became the first chief justice of that colony. He co-operated with Governor Simcoe in organizing Upper Canada and in 1794 was made chief justice of the province of Quebec. He resigned his post in 1801 and returned to his native land, where he afterward filled several important public appointments. He is the author of 'Remarks on the Laws of Descent' (London 1779).

O'SHAUGHNESSY, ō-châ'nĕ-sĭ, **Arthur William Edgar,** English poet: b. London, 14 March 1844; d. 30 Jan. 1881. In 1861 he became a junior assistant in the library of the British Museum, and in 1863 assistant in the zoological department. He won recognition as an authority in herpetology. But he was better known as a poet, his volumes being 'An Epic of Women' (1870); 'Lays of France' (1872), a free paraphrase of the *lais* of Marie de France; 'Music and Moonlight' (1874); and (posthumously) 'Songs of a Worker.' With his wife he collaborated in an admirable children's book, 'Toyland' (1875). Consult the 'Life' by L. C. Moulton (1894).

OSHAWA, ŏsh'ạ-wạ, Canada, town and port of entry of Ontario County, Ontario, near Lake Ontario, and on the Grand Trunk, Canadian Pacific and Canadian Northern railroads, 33½ miles northeast of Toronto. Its harbor on Lake Ontario is called Sydenham. Its industries include manufactories of engines and machinery, agricultural implements, foundry products, furniture, flour, leather, carriages, white wear, musical instruments, etc. Pop. 7,436.

O'SHEA, ō-shā', **Michael Vincent,** American educator: b. Le Roy, N. Y., 17 Sept. 1866. He was graduated (1892) at Cornell and was appointed professor of psychology and education at State Normal School, Mankato, Minn. (1892–95). He became professor at Teachers' College, Buffalo (1895–97), and professor of education at the University of Wisconsin (1897—). He has given numerous lectures on education in America, England and Scotland. In 1910 he was chairman of the International Congress of Home Education at Brussels, and was president of the Society of College Teachers of Education (1911–12). He has written 'Aspects of Mental Economy' (1900); 'Education as Adjustment' (1903); 'Dynamic Factors in Education' (1906); 'Linguistic Development and Education' (1907); 'Social Development and Education' (1909); 'Every-day Problems in Teaching' (1912); and is joint author of 'The Child and His Spelling' (1914), etc. He was editor-in-chief of 'The World Book Encyclopædia' and editor of the *Wisconsin Journal*.

OSHIMA, ō-shē-mä', Japan, a name signifying «great island,» applied to numerous island dependencies of the empire. The chief are (1) Oshima or Vries Island southwest of the entrance to the bay on which stand Tokio and Yokohama; (2) Oshima off the southwest extremity of Hokkaido, opposite Fukuyama; (3) Amami-Oshima one of the largest islands of the Liu-Kiu Archipelago (q.v.).

OSHKOSH, Wis., city, county-seat of Winnebago County, on Lake Winnebago at the mouth of the Upper Fox River, and on the Chicago and Northwestern, the Chicago, Milwaukee and Saint Paul and the Soo Line railroads, about 75 miles northwest of Milwaukee and 85 miles northeast of Madison, the State capital. It was settled in 1836, and in 1853 was chartered. The city was greatly damaged by fires in the years 1859, 1866, 1874 and 1875. It is in a region where there has been extensive lumbering interests, and although the forests have disappeared in some sections lumber is still a leading industry. The chief manufactures are lumber and lumber products, as furniture, matches, sash, doors, matches and blinds, trunks, carpets, wagons and carriages. It manufactures also machine products, grass twine, rugs, carpets, flour, canned goods, tobacco, boilers, washing machines, gas engines, cement miners, truck cabs, toys, typewriters and agricultural implements. The capital invested in industry is $12,375,000 and the total output is valued at $17,500,000. About 6,500 hands are employed in the industries. The bank resources amount to $12,672,000, with clearings aggregating annually $26,198,727. It has a large trade, as the city is the commercial centre of a considerable portion of Winnebago and the adjoining counties. Lake Winnebago is noted for its fish and sportsmen find in the vicinity good hunting grounds. Yachting in summer and iceboating in winter are favorite sports on this lake. The prominent buildings are the government building, city hall, courthouse and the churches and schools. It has Saint Mary's Hospital and about three miles distant are the State Northern Hospital for the Insane, the county hospital for the incurable insane and the county almshouse. The city is also the home of three remarkable sculptural works — a statue of Carl Schurz, a bronze statue of the Indian Oshkosh and a bronze group in honor of city Civil War soldiers. Oshkosh is the seat of a State normal school and has public and parish schools and a public library. The city is under the commission form of government. The assessed valuation in 1919 was $35,410,880, with a tax rate of $1.95 per $100. Pop. 38,000.

OSIANDER, ō-zē-än'dĕr, **Andreas** (classicized form of Hesemann), Lutheran theologian: b. Gunzenhausen, near Nuremberg, 19 Dec. 1498; d. Königsberg, 17 Oct. 1552. As first evangelical preacher at Nuremberg, he exerted himself in furthering the Reformation and Lutheranism, taking part against Zwinglius on the subject of the Lord's Supper. He was also present in the conference at Marburg in 1529 and at the Diet of Augsburg (1530). His refusal to consent to the Augsburg interim in 1548 cost him his position at Nuremberg. By Duke Albert of Prussia, on whom one of his sermons had produced a strong impression, he was appointed preacher and first professor of theology in the newly-erected University of Königsberg and vice-president of the bishopric of Samland. Meanwhile, in 1549, he became involved in a theological dispute, which was embittered by his obstinacy. In a discussion, 'De Lege et Evangelio,' he maintained that justification is not a judicial or forensic act in God, but contained something of a subjective nature, as the imparting of an interior righteousness, brought about in a mystical manner by the union of Christ with men. These views he continued to maintain till his death. Consult Moller, 'Andreas Osianders Leben und ausgewählte Schriften' (1870).

OSIER, ō'zhĕr, the popular name of those species of willow (q.v.) which are used chiefly for basket-making and other wickerwork. They are of low bushy growth and they are the more valuable in proportion to the length, slenderness, suppleness and toughness of their branches. The common osier (*Salix viminalis*), a common native of wet alluvial grounds in many parts of Europe, is cultivated to supply material for basket-makers and is often planted to prevent the banks of rivers from being washed away. See Willow.

OSIRIS, ō-sī'ris, in Egyptian mythology, meaning «full of eyes,» the Greek form of the word, «Hesri» or «Asiri.» He was the son of Seb, the Earth, and Nut, the Sky, the brother and husband of Isis and the father of Horus. He is styled the Manifester of Good, Lord of Lords and King of the Gods. At Abydos was one of his most sacred shrines, and tradition said that there his head had been buried. Great pilgrimages were made to this city and the dead were brought from far-distant parts to be buried in its sacred soil. In the Egyptian theogony he represented the sum of beneficent agencies, as Set of evil agencies. Osiris, after having conquered all Egypt, established good laws and institutions and becoming a sort of culture divinity to the people whom he found in ignorance and barbarism according to tradition, fell a prey to the intrigues of his brother Set. Osiris set out to visit the whole world and continue his mission of culture, and it was during his absence that Set took advantage of conditions and set himself to undo the good done by Osiris. On the king's return Set plotted to destroy him. To do this, he secretly took his measure and had a fine box made exactly his size. This he brought to a feast at which Osiris would be. He offered to make a present of the box to any one who would fill it exactly. Osiris finally got into the box, on which Set and his accomplices shut it and threw it into the Nile, down which it floated to the sea. After a very long search Isis found the body and brought it back to Egypt. Set again got it, cut it and scattered the parts over the land, up and down the river. Isis gathered them up and buried them and each burial place became sacred. He is represented under many different forms and compared sometimes to the sun and sometimes to the Nile. In particular his soul was supposed to animate a sacred bull called Apis and thus to be present continually among men. Sometimes he is represented as a man crowned with a mitre, a globe, a lotus-flower or an elephant's trunk; sometimes with the body of a man and the head of an ox, ibis or other animal; sometimes he holds a stick, sometimes a phallus in his hand. He holds in some representations a whip in one hand and a scourge in the other. He has frequently the horns of a bull. Mythologically he resided in the under-world and was the ruler of the dead.

The worship of Osiris was introduced into Rome but the rites proceeded to such an excess of licentiousness that it was at length prohibited by law. Consult Budge, Wallis, 'The Gods of the Egyptians' (London 1904); Erman, 'Die Aegyptische Religion' (Berlin 1905); Wredemann, 'Religion of the Ancient Egyptians' (New York 1897).

OSKALOOSA, ŏs-ka-loo'sa, Iowa, city, county-seat of Mahaska County, on the Chicago, Burlington and Quincy, the Iowa Central and the Chicago, Rock Island and Pacific railroads, about 65 miles southeast of Des Moines. It was settled in 1843 and incorporated in 1853. It is the commercial centre of a fertile agricultural and stock-raising region. In the vicinity are large deposits of coal, limestone and fire-clay. The chief industries are flour milling, manufacturing vitrified brick, wagons, iron and brass goods, fire hydrants, furnaces, silos, caskets, heaters and woolen goods. It has a large meat-packing plant and coal and brick yards. The principal buildings are the post office, the church, school and library buildings. A bronze statue of the Indian chief Mahaska adorns the principal square. The educational institutions are the Penn College, opened in 1873 under the auspices of the Friends, the Oskaloosa College, under the auspices of the Disciples of Christ, a business school and a public library. The Society of Friends of the State of Iowa hold their annual meeting here. Pop. 9,466.

OSLER, ŏs'lẽr, **Britton Bath,** Canadian lawyer: b. Simcoe County, Ontario, 1839; d. 1902. He was educated at Toronto University and was called to the bar in 1862. He practised for some time at Dundas and at Hamilton but removed to Toronto in 1882. He soon acquired a national reputation as an expert lawyer in criminal cases. In 1885 the Dominion government secured his services in the trial of Louis Riel, and for many other cases of nation-wide interest.

OSLER, Sir **Edmund Boyd,** Canadian financier and legislator: b. Tecumseh Parsonage, Ontario, 1845. He was educated at Dundas. In 1896 he was president of the Toronto Bond Trade and is head of the Toronto financial house of Osler and Hammond. He is president of the Dominion Bank of Canada and director on the boards of numerous industrial enterprises and director of the Canadian Pacific Railway Company. He was created a knight in 1912 and has been member of the Dominion House of Commons for West Toronto since 1896. In 1896 he was one of the representatives of Canada at the Congress of Chambers of Commerce held in London.

OSLER, Sir **William,** Canadian physician, educator and author: b. at Bondhead, Tecumseh, Ontario, 12 July 1849. He studied at Trinity College, Toronto, the Toronto School of Medicine and McGill University, where he graduated M.D. in 1872. He continued his studies at University College, London, Berlin and Vienna and was appointed professor of physiology and pathology in McGill University, Montreal, and to the chair of clinical medicine in the University of Pennsylvania in 1884. He was chosen as the Galstonian lecturer in the Royal College of Physicians, London, England, in 1885, and as the Cartwright lecturer in the College of Physicians and Surgeons, New York, in 1886. In 1889 he was appointed professor of the principles and practice of medicine in Johns Hopkins University and chief physician to the Johns Hopkins Hospital, Baltimore, positions which he resigned in 1904 upon his appointment as regius professor of medicine in the University of Oxford, England. A writer of international repute in various American and European medical journals as well as in other fields, he is the author of 'Clinical Notes on Smallpox' (1876); 'Histology Notes' (1882); 'Cerebral Palsies of Children' (1889); 'Principles and Practice of Medicine' (1892); a standard modern work which had reached a fifth edition in 1903; 'Chorea and Choreiform Affections' (1894); 'Lectures on Abdominal Tumors' (1895); 'Angina Pectoris and Allied States' (1897); 'Cancer of the Stomach' (1900); 'Science and Immortality' (1904); 'Counsels and Ideals' (1905); 'Thomas Linacre' (1908); 'A Way of Life' (1914), and is editor of 'A System of Medicine' (2d ed., 1915). He was created a baronet in 1911.

OSMAN DIGNA, ŏs-män' dĭg'na ("Osman the Bearded"), Sudanese chief: b. 1836; d. 1900. He was of Turkish extraction, a slave trader who suffered financial losses because of English interference with his trade; raised an army in 1881–82 to assist Arabi Pasha against the British; as chief of the sheiks of Eastern Sudan contributed largely to Gordon's capture and death by blocking the approach to Khartum, through Suakim; was the hero of a long and costly siege at Tokar in 1887–88; joined the Mahdi in the rising of 1899, and in 1900 was captured and imprisoned at Rosetta.

OSMAN NURI PASHA, noo'rē păsh'â, called Ghazi, "the Victorious," Turkish general: b. Amasia, Asia Minor, 1837; d. Constantinople, 5 April 1900. He saw service against the Druses in 1860 and in Crete in 1867–69, fought in the Yemen campaign of 1871, became marshal in 1876 and in the war with Russian, after bold and brilliant manœuvres, occupied Plevna, which he was forced to surrender 10 Dec. 1877, in spite of his heroic attempt to break through the forces of his besiegers. He was returned to Turkey after the Treaty of San Stefano, entrusted with the reorganization of the Turkish army and was Minister of War 1880–85 and marshal of the palace after 1880. Consult Levaux, 'Ghazi Osman Pacha' (1891). See Russo-Turkish War.

OSMANIE, ŏs-mä'ne-ä, **Imperial Order of.** See Orders, Royal.

OSMANTHUS, genus of trees of the natural order *Oleaceæ*, of which about 13 species are indigenous to North America, China and Japan. The species *O. americanus* is called devilwood in southern United States. It attains a height of 45 feet and a diameter of one foot. Other species are grown as ornamental shrubs in China and Japan.

OSMELITE, the same as PECTOLITE (q.v.).

OSMIUM, a metallic element of the platina group, commonly found with iridium (q.v.) and the heaviest and most infusible of metals. It was discovered by Tennant in 1804. Osmium-iridium is found in Neoyanskite and Sysserskite as very hard black grains; as a cubic or obtuse rhombohedral crystal it is bluish white, with violet lustre and greater hardness than glass. The element has the atomic weight 195 and the high specific gravity of 22.5. Osmium can be fused only by the heat of an electric arc. It forms three chlorides, $OsCl_2$, $OsCl_3$ and $OsCl_4$; the oxids, OsO, Os_2O_3, OsO_2, OsO_3 and OsO_4, commonly called osmic acid, which has pungent and poisonous vapors, is extremely volatile and is a powerful oxidizer. In alloy with iridium, osmium is used for pointing gold pens.

OSMOSIS, the diffusion of fluids through membranes. If a septum composed of either organic (such as a bladder) or inorganic (such as porous earthenware) be interposed between two liquids holding different substances in solution, the liquids will pass through the septum carrying some of the matter in suspense with them; that is, they will diffuse one into another. This phenomenon is called osmosis. The liquids pass through the interposed medium at different rates, gradually getting slower until, they are said to be balanced. If a bladder filled with a solution of sugar be immersed in water, seven parts of water (by weight) will enter the bladder while one part of sugar escapes into the water. The action of the liquid parting with its soluble matter is called endosmosis, the flow of the liquid receiving it exosmosis. Both must act simultaneously, one cannot exist independently of the other; together they constitute the phenomenon of osmosis. Endosmosis usually takes place in the direction of the denser liquid, although there are some exceptions, such as ether, alcohol, etc., which act like liquids heavier than water. This diffusion has variously been explained by capillary attraction, unequal absorption and chemical action, but the real explanation of osmosis appears to be along the lines of the kinetic theory of gases, which exert a pressure quite analogous to that of dissolved substances. In order to have osmosis take place the liquids on either side of the interposing septum must be of unequal osmotic pressure. See CHEMISTRY.

Osmosis plays an important part in plant physiology. The plant cell consists of a mass of protoplasm enclosed within a flexible organic membrane (the cell wall) and enclosing a fluid. This membrane is permeable to water and generally, though not always, to all substances it may hold in solution; but the protoplasm itself is only permeable to water containing such substances as it requires for its nutrition — it would seem to be endowed with the power of selection. Thus cells in different plants or cells in different parts of the same plant possess very different powers of osmosis The osmotic pressure varies from two atmospheres in rare cases to 100 in certain tissues exposed to much loss of water by evaporation or by the presence of a medium of high osmotic pressure. The pressure within a cell may be measured by putting it in a medium which just causes it to show signs of losing its contents; another method depends on the fact that a soluble lowers the freezing-point of its solvent by an amount proportional to its osmotic pressure. Water is the only solvent in plant life. When a cell becomes full or swollen it is said to be turgid, but this turgidity is constantly relieved by osmosis taking place from cell to cell and by final evaporation. As soon as the osmotic pressure in one cell falls below that of a cell or cells with which it is in juxtaposition, osmosis takes place and thus a fair degree of equilibrium is maintained. The supply of food-stuffs is kept up in a like manner. Osmotic pressure is enhanced by electrolytic dissociation (see DISSOCIATION) which takes place in plant life on account of the presence of acids and salts (electrolytes) of various kinds which are found in solution both in and surrounding all plant life. The phenomena of osmosis still present a fertile field of research for the scientific mind. See ABSORPTION; SOLUTIONS. Consult Findlay, A., 'Osmotic Pressure' (New York 1913); Jost, L., 'Lectures in Plant Physiology' (2d Eng. ed., Oxford 1914); Morse, H. N., 'Osmotic Pressure of Aqueous Solutions' (Washington 1914); Philip, J. C., 'Physical Chemistry: Its Bearing upon Biology and Medicine' (New York 1913).

OSMUN, Thomas Embley («ALFRED AYRES»), American orthoepist: b. Montrose, Ohio, 26 Feb. 1834; d. New York, 26 Oct. 1902. He was graduated from Oberlin College and later studied medicine in Paris and Berlin. In 1859 he returned to the United States and settled in New York. Resolving to make a lifework of the purification of the English language as used in the public press, he became an authority on the use of English and also attained distinction as a dramatic critic. Subsequently he taught elocution, and in 1891 he appeared as Shylock in Boston and other New England cities. He was one of the editors of the 'Standard Dictionary.' He published 'The English Grammar of William Cobbett' (1884); 'The Orthoepist' (1880); 'Some Ill-Used Words' (1901), etc.

OSMUNDA, a genus of tall ferns with large stout rootstocks and sporangia borne on the veins of reduced leaves. One species, the royal fern (*O. regalis*), is cultivated on account of its elegant appearance. It grows in clumps of two to five feet in height, and is well adapted for open moist places, where the soil is rich and shade thin, or even where full sunlight falls.

Other well-known species occurring in America are the cinnnamon fern (*O. cinnamomea*) and the interrupted fern (*O. claytoniana*).

OSNABRÜCK, ŏs'nä-brük, Germany, a town of Hanover, Prussia, on the Haase, 70 miles west of Hanover. In the old town the streets are generally narrow and the houses low; but the new quarters have wide and handsome streets and fine residences. The chief buildings are the ancient Protestant churches of Saint Catherine and Saint Mary; the Roman Catholic cathedral (13th century); the Protestant and Roman Catholic gymnasiums, the town-house, with statues (1889–90) of German emperors on the façade; the Friedenssaal (Hall of Peace), restored in 1890; the museum (1889), the new hospital, teaching colleges, libraries and the commercial school. Osnabrück has iron and steel works, railway workshops, machine-shops, iron-foundries, wire-works, paper-mills, flax and cotton-mills, bleach-fields, tile-works, breweries, etc. There are iron mines and stone quarries in the vicinity. Osnabrück gave its name to the coarse linen known among English-speaking people as osnaburgs. It was created a see in 888, and in 1082 was surrounded by walls. It afterward entered the Hanseatic League, but never became a free imperial city. The negotiations for the Peace of Westphalia, which ended the Thirty Years' War, were carried on here. Pop, 65,967.

OSORIO, Manoel Luiz, mă'noo-ĕl' loo-ēth' ō-sō'rē-ō, Brazilian soldier: b. near Pelotas, Brazil, 10 May 1808; d. Rio de Janeiro, Brazil, 4 Oct. 1879. He entered the army at an early age and in the Civil War in Rio Grande do Sul, 1839–45, he attained distinction. In the campaign in Uruguay in 1851–52 he was again prominent and at the outbreak of the Paraguayan War in 1865 was made commander-in-chief, but was superseded by Caxias in 1866. He was made lieutenant-general in 1867 and continued to serve until 1869, when he was seriously wounded. He entered politics after the war, became senator in 1877, and from 1878 until his death was Minister of War. He was created Marquis of Herval by the government, but his chief title of honor was «O Legendario» (the Fabulous) bestowed upon him by his soldiers for his bravery.

OSPREY. See Fish-hawk.

OSSA, ŏs'ą, Greece, the classic name of Kissavos, a mountain 6,408 feet high, in the northeast of Larissa, overlooking the Gulf of Saloniki. The Vale of Tempe separates it from Olympus, 9,794 feet high, and to the southeastward is Mount Plessidi — ancient Pelion — 5,308 feet high. These three mountains are renowned in Greek mythology, and the classic phrase «piling Ossa upon Pelion» refers to the giants Ephialtes and Otus arranging to place Ossa upon Pelion to aid them in reaching the summit of Olympus. This conception is said to have been suggested by the conical form of Ossa and the flat summit of Pelion. The seats of the Centaurs and Giants are located in the neighborhood of Ossa and Pelion.

OSSEIN, ŏs'ę-ĭn, the organic basis of bone allied to gelatine. If a bone is placed in acid, 20 per cent hydrochloric, the inorganic matter (salts, etc.) is dissolved out and by repeated washings only the organic matter remains. This retains the shape of the bone without its hardness. It will not dissolve in cold water, but if boiled with dilute mineral acid it reduces to gelatine. Ossein is closely related to, if not identical with, the collagen of the connective tissues. Bone also contains a mucoid and an albuminoid. See Bone.

OSSETES, ŏs'ēts', a people of the central Caucasus region, supposedly of Iranic origin, because of their native name (Iron) and physical characteristics, although there is a tradition among them that they came from the region of the Don in Russia. They are tall, and have broad heads, but are by no means as attractive appearing as their neighbors of the Caucasus. Their religion is an admixture of Mohammedanism and Christianity. Consult Chantere, 'Recherches anthropologiques dans le Caucase' (Paris 1887), and Kovalevski, 'The Customs of the Ossetes' (in the *Journal* of the Royal Asiatic Society, 1888).

OSSETIC (ŏs-sĕt'ĭk) **LANGUAGE**, an Iranian language spoken by the Ossetes (q.v.) of the Caucasus. It is analytic in form. Cases are formed by postpositions. There are three verbal tenses, past, preterite and future, with indicative, optative, subjunctive and imperative moods. Auxiliary verbs aid in the formation of compound tenses and of other voices than the active. The chief dialects are Ironish or Irish, and Tagaurish, Digorish and Taulish. Of these Tagaurish is the most important for the linguist and phonologist. Folktales and the Bible represent the literature of this remnant of an ancient language. Both the Armenian and Russian alphabets are used. The language is spoken by about 125,000 people. Consult Hübschmann, 'Die Sprache der Osseten' (Strassburg 1903); Rosen, 'Ossetische Sprachlehre' (Berlin 1844); Sjögren, 'Ossetische Sprahlehre' (Saint Petersburg 1844).

OSSIAN, ŏsh'ĭ-ạn, or more correctly, **OISIN**, appears in Gaelic literature and legend as the son of Finn, or Find, the hero of what has been styled the Fennian or Oisianic cycle of tales and poems current in Ireland and the highlands of Scotland. Finn is the hero of all these tales and poems, as Arthur is of the Arthurian cycle; Oisin is his poet and bard, as well as his son. This Oisianic cycle exists side by side with a heroic cycle which consists of about 30 tales, forming one of the most complete epic cycles to be found in any literature. They are tales of battle, narratives of adventure, all circulating round the person of the hero Cuchulaind. They are mixed prose and verse and many of them are extant in manuscripts written about the 12th century. The Oisianic cycle is of a different period. Finn, the heroic figure, is a less legendary and mythological personage than Cuchulaind; he lives in the 3d century at the time when the Romans occupied Great Britain and moves through the story almost like a historical character; the supernatural is relatively infrequent in his adventures, and he fights his battles as a leader of mercenaries engaged, after the country has been conquered, in keeping the native races of Scotland in check. These stories are found in good manuscripts of the 15th century and their style points to the fact that a stage of culture has been reached by the rude inhabitants of North Britain very different from that described in the heroic cycle, where Medb, queen of Connaught, contends with Mac Nessa, king of Ulster, for the possession of the brown bull of Cualnge, and Cuchulaind defends Ulster single-handed and discomfits with his unaided sword the valor of whole armies. In the heroic cycle the characters are completely mythological, but they are distinctly described as to their dress or arms. In the Oisianic cycle the figures of the actors become more vague; there is an exaggeration in the reported exploits of the warriors, although the excitement of the hunt and the riot of the royal drinking bout, as therein depicted, are evidently clear transcripts from the primitive life of their period. There is one important point to be noted with regard to these two types of ancient Celtic literature in Scotland. They are as distinct in style, color and development as in their *dramatis personæ*. They belong to different eras, and their heroes never meet on the same stage; the hero of the earlier cycle has vanished when Finn, the Oisianic warrior, comes upon the battlefield.

This is a very important point in deciding one of the virulent literary controversies of the 18th century. The Celtic legends as they were preserved orally or in manuscript attracted the fancy of James MacPherson (q.v)., a Scottish schoolmaster, who published what he averred to be translations from "the Gaelic or Erse" in the shape of "Fragments of Ancient Poetry" (1760), and subsequently produced ‘Fingal’ (1762) and ‘Temora’ (1763), afterward collected into a single volume under the title ‘The Poems of Ossian.’ There was much merit in these works as poems. The descriptions of scenery were often beautiful and approaching the sublime, and the wildness of highland mountain and lake was vividly portrayed. But apart from the want of detail in the account given of the dress, buildings and social life of the personages introduced there was one circumstance that proved these poems to be anything but translations of a connected "Gaelic or Erse" composition. The heroes of the heroic cycle were made to mingle with the heroes of the Oisianic cycle in the narrative. And this was not all. MacPherson never produced during his lifetime the original poems which he averred were in his possession. After his death, however, some manuscripts were found in which fragments from both periods of genuine ancient poetry were found patched together in a cento with some very indifferent Gaelic of his own, and so arranged as to form a sort of counterpart to his ‘Poems of Ossian." The more recent studies in Gaelic literature have furnished us with this solution of the Ossian controversy; and have made it apparent that, while MacPherson might have been at liberty to fuse certain ancient poems, as Fitzgerald has done in his Omar, to produce a beautiful romance of his own, he committed a grave and unpardonable error in attempting to forge originals to support his claim that his work was a translation pure and simple. Consult Simpson, ‘Poems of Ossian’ (1857); McLauchlin, ‘The Book of the Dean of Lismore’ (1862); Nutt, ‘Ossian and the Ossianic Literature’ (1899); Rolleston, T. W., ‘Myths and Legends of the Celtic Race’ (New York); Windische, ‘Die Altirische Sage und die Ossianischen Gedichte’ (1878).

OSSIAN-NILSSON, ōs'sĭ-ạn-nēls'sŏn, **Karl Gustaf,** Swedish poet: b. Lund, 1875. He received his education at the university of his native town and entered the teaching profession. He won a literary reputation in 1900 with ‘Fem dikter’ and ‘Masker.’ This was enhanced by other works such as ‘Hedningar’ (1901); ‘Ornar’ (1902); ‘Svart och hvitt’ (1904); ‘Amerikaner och byzantiner’ (1905); ‘Orkester’ (1907); ‘Flygskeppet’ (1910); ‘Prästgården’ (1911); the novels ‘Barbarskogen’ (1908; 7th ed., 1913); ‘Slätten’ (1909); ‘Hafvet’ (1910); ‘Odets man’ (1912); Lille Benjamin’ (1913); and the metrical drama ‘Fågel Fenix’ (1912).

OSSIFICATION, the process of bone formation, which in all cases essentially consists of the deposition of earthy or calcareous matter. It may exhibit two modes of occurrence. Bone may be formed by the deposition of earthy or osseous material in fibrous membranes, that is, in tissues composed of fibres and cell elements. The flat bones of the skull or cranium are developed in this first manner. No granular or intermediate stage is observable in this process, the earthy matter being simply deposited in spaces which result from absorption. In the second mode, exemplified in the formation of the long bones of the skeleton, the osseous material is deposited in a primary basis of gristly or cartilaginous kind. Ossification in this latter instance is, therefore, said to begin in cartilage, just as in the previous case it began in membrane. The process of ossification in cartilage exhibits activity at several distinct and marked points of its extent. These points are the active centres of bone-growth, and are hence called centres of ossification. The limy material is, therefore, diffused from these centres throughout the extent of cartilage, the blood vessels of the adjoining parts bringing supplies of material from which the earthy matters are deposited within the cartilaginous basis. The corpuscles of the cartilage are seen to be arranged in verticle rows, and the calcareous matter, deposited in the form of granules, is thrown in around them. The nuclei of the cartilage cells are left unossified, a space also being kept free around each nucleus, which becomes one of the lacunæ or minute cavities seen in a microscopic section of bone-tissue. The first deposits of bony matter are of an irregular and thick description, this form of ossification, if persisted in, producing cancellated bony tissue; while by a subsequent process of absorption of the spaces in the cancellated tissue, and by the further deposition of bony matter, the irregular tissue is converted into compact bone. The gradual growth of bone takes place by a continual development of the cartilaginous basis between the various centres of ossification, and in this new basis earthy matter is as continually being formed.

True ossification may also occur abnormally in living textures and as the result of diseased conditions. This is particularly likely to take place in the muscles, as in those of the right shoulder of the infantryman, which is irritated by his rifle, or of the thighs of the cavalryman. The ossification of the muscles may also form part of a progressive general disease. Deposits of limy matter may take place within the coats of blood vessels, rendering them friable and readily ruptured. The valves of the heart may become calcareous, and calcareous degeneration may even affect tumors and other products in themselves of abnormal nature. A distinction ought to be made between mere calcification as just indicated, and true ossification, or the formation of bone. But in either case the deposition of limy matter forms the basis or essential feature. The gall-bladder may thus be converted into a hard limy sac or bag, and even the pericardium or investing sac of the heart may occasionally exhibit a high degree of calcification. See BONE.

OSSINING, ŏs'sĭn-ĭng, formerly **SING SING, N. Y.,** village in Westchester County, on the Hudson River, and on the New York Central and Hudson River Railroad, about 30 miles north of New York. It was settled about 1698, incorporated as a township 2 May 1845 and as a village some years later. The name Sing Sing, by which it was known until 1901, comes from an Indian word meaning a stony place. One of the State prisons is located here, just outside the village limits, and is known as Sing Sing prison; hence the villagers desired a change of name, and chose Ossining. The village, located upon rocky hills, overlooks Tappan Bay and a long and beautiful part of the river. In the early part of the 18th century silver, copper and some gold was found here, and considerable capital was expended in developing mines which never proved productive. The chief manufactures are shoes, leather, machinery, foundry products, pills, porous plasters, drills and plated goods. The trade is chiefly in its own manufactures and farm products. Some of the places of interest are the Croton Aqueduct Arch, 88 feet span and 70 feet above water, and the arched highway bridge. The State prison, a large white building made of dolomite, a coarse marble quarried nearby, was founded in 1826. Capt. Elam Lynds brought here 100 convicts from the State prison at Auburn and put them to work to wall themselves in. Men only are confined here. The village has long been noted for its educational institutions; it has Holbrook, Saint John's and Mount Pleasant Military academies, the Roman Catholic Foreign Mission Seminary, Ossining Seminary for young women, public and parish schools and a public library. There are six churches. The two banks have a combined capital of about $200,000. The government is vested in a president and nine trustees. The president and three trustees are elected each year. The village owns the waterworks. Pop. 12,987. Consult Ingersoll, ‘Hudson River and Catskill Mountains’; Scharf, ‘History of Westchester County’ (Philadelphia 1886).

OSSOLI, ŏs'sō-lē, **Sarah Margaret Fuller,** MARCHIONESS, American writer: b. Cambridgeport, Mass., 23 May 1810; d. off Fire Island beach, 19 July 1850. She was remarkable for her precocity and her association with Emerson and other eminent literary men, rather than for her own productions. She was taught at six to read Latin, and early made herself acquainted with English and Continental literature. She taught in public and private schools in Boston and Providence, and frequently visited Brook Farm (q.v.), though she never resided there and had no confidence in the final success of that enthusiastic experiment. In 1840–42 she was editor of the *Dial*, which numbered Emerson and other distinguished writers among its contributors. In 1844 she removed to New York and became literary critic of the *Tribune*. In that capacity she worked effectively toward the increase of public interest and the improvement of public taste in literary, artistic and other matters. She visited Europe in 1846, met there leaders in literature, art and philanthropy, married in 1847 the Marquis d'Ossoli; was in Rome during the siege of 1849, when she served in the hospitals; embarked with her husband for New York, but perished almost in sight of port during a severe storm. The position she took in the American literary world of the time would perhaps be not wholly intelligible to one now reading much of what she wrote. Her critical articles are her best by far, many being brilliant and exhibiting what Higginson calls “the power of putting a high thought into a sentence.” She strove to abolish the colonial spirit in American thought and letters, and contemporaries bear witness to the reality and excellence of the service. Consult the ‘Memoirs’ by Emerson, Clark and Channing (W. H.) (1852); and the biographies by Howe (1883); and Higginson (1884); ‘American Men of Letters’ series.

OSSUNA, ō-soo'nä, **Duke of.** See OSUNA, PEDRO TELLEZ Y GIRON, DUKE OF.

OSTADE, ŏs'tä-dĕ, **Adrian van,** Flemish painter: b. Haarlem, 10 Dec. 1610; d. there, 2 May 1685. He studied under Frans Hals. His pictures exhibit an exact imitation of nature, and contain realistic respresentations of subjects which in other hands would have been mean or commonplace, such as the interiors of ale-houses or kitchens, with Dutch peasants smoking, quarreling or drinking; and he puts such expressions into the heads of his characters that their coarseness is lost in our admiration of their truth and animation. His coloring is rich and clear, his touch spirited and free and all his works are highly finished. His later works were somewhat overwrought. He was also a good etcher; Jan Steen was a pupil of his. Among his pictures (which are generally small) may be mentioned ‘The Smoker’; ‘The Drinker’; ‘The Dancer.’ He also painted many portraits.

OSTADE, Isack van, brother and pupil of the preceding, Flemish painter: b. Haarlem, 2 June 1621; d. there, 16 Oct. 1649. He at first applied himself to paint the same subjects as those which had brought such a brilliant reputation to his brother, but soon abandoned taverns and kitchens for scenes in the open air, both summer and winter landscapes, and with such success that at the time of his death he was rapidly rising to be a rival to his brother. Original in style, his pictures are remarkable for good composition, masterly drawing and solid painting. Many of them are in England, where they were valued before his fellow-countrymen came to a knowledge of his genius. Among the most valued of them are ‘A Village Inn’; ‘View of a Frozen Canal’; ‘Landscape and Cottages;’ ‘Village Scene’ (showing cavalier on gray horse, horsemen with red cloak and post wagon); ‘Winter Landscape in Holland.’ The ‘Halte de Voyageurs’ and ‘Vue de Village’ were sold (1865) for upward of $5,000 each.

OSTEITIS, inflammation of the substance of bone. In its chronic forms it may result in suppuration; in caries, a decay of the bone in particles; or in necrosis, a decay of the bone in slices. Removal of the diseased bone may be required.

OSTEN-SACKEN, ŏs'tĕn-săk'kĕn, BARON **Charles Robert,** Russian entomologist: b. Saint Petersburg, 21 Aug. 1828; d. 1906. He was educated in his native city and became connected with the Imperial Foreign Office in 1849. He came to the United States in 1856 as secretary of legation at Washington and in 1862 became Russian consul-general at New York. In 1871 he resigned his public office but remained in the United States until 1877. With Mr. H. Loew he studied the Diptera of North America, and published numerous papers on this subject and two catalogues.

OSTEND, ŏs-tĕnd', Belgium, a seaport town and pleasure resort, in the province of West Flanders, on the North Sea, 67 miles northwest of Brussels. Ostend is connected by rail with all parts of Belgium, France and Germany; and steamers ply regularly to and fro from London and Dover. It was strongly fortified prior to 1865, since when the fortifications have been replaced by fine promenades. It has a healthful situation, although on a low sandy coast, and is resorted to for sea bathing, etc., by about 50,000 visitors annually. Along the sea front is a massive digue or esplanade of stone and terra-cotta, three miles long, forming a fine promenade. The public buildings include the Hotel de Ville, three churches (one finished in 1883), an English church, large Kursaal, barracks, etc. The harbor is not easy of access, but has been greatly improved since 1898; the basins within are extensive, giving 32 feet at high water, and form the termination of a magnificent line of canals stretching like a network into the interior, and furnishing admirable facilities for commerce. The manufactures are unimportant, the chief being linen, sail cloth and tobacco. Shipbuilding is also carried on. Cod and herring fishing are considerable industries, and an important branch of trade is oysters, fattened here in large salt reservoirs, and transported as far as Paris. Ostend was founded in the 9th century, walled in 1445 and regularly fortified in 1585 by the Prince of Orange. In the great struggle to throw off the yoke of Spain it sustained a memorable siege from 4 July 1601 to 28 Sept. 1604, during which the besieged lost about 50,000 men, and the Spanish besiegers more than 80,000. Pop. 43,002.

During the Great War Ostend was for a short time the capital of Belgium; but it was captured by German forces on 15 Oct. 1914, suffered considerably at their hands and later from British air attacks.

In March 1919 the town of Ostend furnished the Minister of the Interior with a list of the sums claimed before the Peace Conference for reparation in respect of the war damage which the town had suffered. Ostend expended about 20,000,000 francs ($4,000,000) in forced requisitions; while the damage done to public buildings was valued at 57,000,000 francs ($11,400,000), or a total of 77,000,000 francs ($15,400,000), without counting the losses caused to private individuals. During the war Ostend was bombarded 187 times, and 271 persons were killed and 436 injured in the shelling.

OSTEND MANIFESTO, The, a term used in the diplomatic history of the United States since 1854. In that year, 9 October, a dispatch was forwarded to the United States government by the American ministers at the courts of Great Britain, France and Spain, who had met in the city of Ostend, by the government's request, to discuss the Cuban question. The dispatch declared that, if Spain would not sell Cuba, self-preservation required the United States to take the island by force, and prevent it from being Africanized like Haiti. They advised offering $120,000,000 for the island. The suggestion was not approved in the United States by statesmen or politicians and was strongly condemned.

OSTEOLEPIS, a genus of fossil long, slender crossopterygian fishes, peculiar to the Lower Old Red Sandstone of Scotland. It is characterized by smooth rhomboidal scales, by numerous sharply pointed teeth and by having the two dorsal and anal fins alternating with each other. This, with *Diplopterus*, etc., constitutes the family *Osteolepidæ*, represented in America by the genus *Megalichthys* of Carboniferous and Permian formations.

OSTEOMALACIA (also called MALACOSTEON and MOLLITIES OSSIUM), a disease occurring most frequently in women, but sometimes in men, characterized by softening of the bones through progressive disappearance of the earthy salts. It affects the different parts of the skeleton, and deformities are often caused by it. It is mainly confined to adults, does not ordinarily attack the aged, and among women is likely to be associated with pregnancy, or to follow child-bearing, abstention from which affected women should strictly practise. It may progress for years, and then end in fatal complication with lung disease, or through exhaustion. The causes assigned are many, but their determination is as yet incomplete. Surgery has sometimes proved more efficacious than medical treatment in this disease, which demands the most thorough hygienic care in all cases.

OSTEOLOGY, Human, that branch of anatomy which treats of bone or of bones. The bony element of the body is for the maintenance of form and motion, support of weight and muscles, and the protection of the internal organs. It is one of the hardest structures of the body, possessing a certain degree of toughness and elasticity. See BONE.

Development of Bone.— In the fœtal skeleton the long bones of the limbs are cartilaginous. Hence there are two kinds of ossification, intracartilaginous and intramembraneous, and to those must be added the subperiosteal. In intracartilaginous ossification the cartilage-cells increase rapidly in number and arrange themselves in rows, the cells being closely packed and wedged together. The intracellular matrix of the cartilage is semi-transparent. Lying below this cartilaginous layer near the centre of ossification is a layer composed of osteoblasts. The bones of the vertex of the skull are entirely formed by intramembranous ossification.

Marrow.— The marrow differs in composition at different periods of life and in different bones. In the young it is a transparent reddish fluid of tenacious consistency, free from fat, and contains minute roundish cells. In the shafts of the adult long bone the marrow is of a yellow color and contains a large quantity of fat and areolar tissue. In the flat and short bones, in the articular ends of the long bones, in the bodies of the vertebræ, in the base of the cranium, in the sternum and ribs, it is of a red color, consisting of albumen and extractive matter with a mere trace of fat.

Nourishment of Bone.— This is derived from the numerous blood vessels and lymphatic glands. Those of the compact tissue are derived from a dense network of vessels ramifying in the periosteum. From this membrane vessels pass into the minute orifices of the compact tissue.

Bones of the Human Body.— The skeleton of the adult consists of 206 distinct bones. The spine proper or vertebral column includes 26; the cranium, 8; the ossicles of the ear, 6; the face, 14; os hyoides, sternum and ribs, 26; upper extremity, 64; lower extremity, 62.

Long, Short, Flat and Irregular Bones.— The long bones, found in the limbs, are built to sustain the weight of the trunk and confer the power of locomotion. A long bone consists of a lengthened cylinder, a shaft with two extremities. The shaft is a hollow cylinder, the walls consisting of a dense compact tissue of great thickness. They are the humerus of the arm, radius and ulna of the forearm, carpus, metacarpus and phalanges of the hand; the femur of the thigh; tibia and fibula of the leg; tarsus, metatarsus and phalanges of the foot. Where a part of the skeleton is intended for strength and compactness and its motion is at the same time slight and limited, it is divided into a number of small pieces united together by ligaments. The separate bones are short and compressed, as, for example, the bones of the carpus and tarsus. These bones in their structure are spongy throughout except at their surface, where there is a thin crust of compact tissue. Where the principal requirement is either extensive protection or the provision of broad surfaces for muscular attachment, the osseous structure is expanded into broad, flat plates, as seen in the bones of the head, pelvis, foot and hand. The irregular or mixed bones are such as from their peculiar form cannot be grouped under the preceding heads. They are the vertebræ, sacrum, coccyx, temporal and sphenoid.

The spine is a flexuous and flexible column formed of a series of bones called vertebræ. They are 33 in number exclusive of those which go to form the skull, and have received the names cervical, dorsal, lumbar, sacral and coccygeal, according to the position they occupy; seven cervical, 12 dorsal, five lumbar, five sacral and four coccygeal. The sacral and coccygeal vertebræ consist at an early period of life of nine separate pieces, which are united in the adult, so as to form two distinct bones, the sacrum and the coccyx. Each typical vertebra consists of two essential parts, an interior solid segment or body, and a posterior segment or arch. The bodies of the vertebræ are piled one upon the other, forming a strong pillar, for the support of the cranium and trunk, the arches forming a hollow cylinder behind for the protection of the spinal cord. The different vertebræ are connected together by means of the articular processes and the intervertebral cartilages while the transverse and spinous processes form levers for the attachment of muscles. Between each pair of vertebræ apertures exist through which the spinal nerves pass from the cord. The peculiar vertebræ of the cervical arc the atlas and axis modified from the other vertebræ to admit of the nodding and rotary movement of the head. The atlas supports the globe of the head, the axis forming a pivot upon which the head is rotated. To the atlas and axis are attached the muscles of the neck and spine.

The large triangular bone situated at the base of the vertebral column at the upper and back part of the pelvic cavity is called the sacrum (q.v.).

The coccyx, the extreme end of the spinal column, in shape resembles a cuckoo's beak. It is formed of four small rudimentary vertebræ. It articulates with the sacrum and is attached to the levator and sphincter-ani muscles, the gluteus maximus, and the coccygeus muscles.

The superior expansion of the vertebral column is called the skull, and includes the cranium and the face. See Skull.

The hyoid bone is named from its resemblance to the Greek, upsilon. It is called the lingual bone because it supports the tongue. To it are attached the muscles of the throat.

The sternum is a flat narrow bone situated on the median line of the front of the chest, and to it are attached some of the muscles of the chest and adbomen, articulating with the clavicles and seven costal cartilages on each side.

The ribs are elastic arches of bone which, with the intercostal muscle, form the thorax. They are 12 in number on each side. The first seven are connected behind with the spine, and in front with the sternum through the intervention of the costal cartilages. The next three, or false ribs, articulate with the costal cartilage of the seventh rib; the next two, or floating ribs, are free. To the ribs are attached the muscles of the chest, abdomen, throat, back and diaphragm.

The anterior portion of the skeletal foundation, so to speak, of the arms, is called the clavicle, or collar-bone. See Clavicle.

The scapula forms the back part of the shoulder. It is a large flat bone triangular in shape, situated at the posterior aspect and side of the thorax between the first and eighth ribs. To it are attached the muscles of the shoulder, arm and thorax.

The humerus is the longest bone of the upper extremity. It consists of a shaft and two extremities, articulating above with the scapula and below with the ulna and radius. To it are attached the muscles of the arm, the forearm and thorax.

The ulna is a long bone placed at the inner side of the forearm parallel with the radius and articulating with the humerus, forming the elbow-joint.

The radius is situated at the inner side of the forearm parallel with the ulna, with which it articulates, forming at its lower end the wrist-joint. The ulna and radius form the attachment for nearly all the muscles of the arm, hand and fingers. See Arm.

The hand is subdivided into three segments, the carpus or wrist, the metacarpus or palm, and the phalanges or fingers. See Hand.

The os innominatum, or hip-bone, forms the side of the pelvic cavity. It is divided into three portions, the ilium, ischium and pubis. It articulates with its fellow of the opposite side, the sacrum and the femur. It forms the attachment of the muscles of the thigh, abdomen and pelvis.

The longest bone in the skeleton, to which are attached the muscles of the leg and thigh, is the femur (q.v.).

The patella (q.v.) protects the front of the knee-joint and increases the leverage of the quadriceps extensor muscle. The tibia, situated at the front and inner side of the leg, beginning at the knee, is long and narrow, with enlarged extremities, articulating with the femur, fibula and astragalus. The fibula is situated at the outer side of the leg, is smaller than the tibia, and forms with it the attachment of the muscles of the leg and foot. The bones of the foot consist of three divisions, the tarsus, metatarsus and phalanges. See Foot; Ossification; Osteology, Comparative. Consult Dwight, T., ‹Clinical Atlas› (Philadelphia 1907); Fraser, J. E. S., ‹Anatomy of the Human Skeleton› (ib. 1914); Gegenbaur, C., ‹Lehrbuch der Anatomie des Menschen› (7th ed., 2 vols., Leipzig 1899).

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OSTEOMYELITIS, inflammation of the inner lining membrane (endosteum) and the marrow-cavity of bone, a disease of rare occurrence, mostly following amputations, although occasionally folowing in the train of other diseases. It also follows wounds whereby the medullary canal is exposed to the air, such as gunshot wounds, compound fracture, etc. The inflammation is due to pyogenic infection, is generally acute and extends from the marrow to the osseous structure itself. Chills, sweats and high fever sometimes accompany the usual symptoms of pain and swelling, with a purulent discharge appear sloughs of tissue and dead bone. The disease usually ends fatally by general infection. Surgery alone is practicable in the direct treatment, with such medical and hygienic accessories as the physician may prescribe.

OSTEOPATHY. The essential features of osteopathy as a school of the healing art is its mechanical viewpoint of the bodily organism. The human body is a complete organism constructed after a definite mechanical plan of which every tissue, organ and part has a distinctive arrangement, position and function. Every unit of the structure is in mathematical concordance with all other parts and the whole after the manner of any complex and unified mechanism. Bio-physics and bio-chemistry of the organism explain the known and verifiable phenomena. It is upon this solid and modern scientific ground that the school of osteopathy has built its foundation.

It is a biologic axiom that structure determines and controls function. Given an intact structure, a mechanism that is mathematically correct, it is reasonable to infer that function will be normally operative. The osteopathic school accepts this as fundamental. If structure is distorted or disarranged, order or health accordingly will be impaired. It is obvious that gross derangement of the structure will disturb harmonious action of its parts; but osteopathic practice not only accepts this as true, but applies the same principle to all tissues, even to a minute degree. The development and application of this principle to every portion of the organism, the mechanical construction of the tissues and their possible innumerable displacements and derangements, is the basis of the theory and practice of osteopathy.

The Body is a Vital Organism.— Biologically the human mechanism is something more than a mere machine; it is a vital organism. Therefore, it is conditioned from within, and every part conditions every other part and the physiologic unity of the whole. Although structure modifies and controls function, still the two are inseparable, for it is function that produces structure. Derangement of mechanism registers its effects structurally, and change in character of functioning will also be expressed structurally. The structural expression, if correctly interpreted, is osteopathically invaluable.

It may be said that life is function; and it is the function of self-repair that exemplifies the vital completeness of the body. The body contains inherently, active and potential, all the necessary properties for growth, development and repair. Nothing can be done that will add a morphologic or physiologic unit to the organism. But much can be accomplished to influence properties and forces that are disorganized to the point of functional discord, as well as to stimulate and develop active and potential ones.

The human body being an adaptable vital organism, the environment of structure and function comprises the essential feature in the field of therapeutics. Not only must the assemblage of the parts be precise in a mechanical sense, as is demanded of any mechanism, for it to operate normally, but function must be neither abused nor disused or else the functioning process will be abnormally conditioned. Both anatomically and physiologically considered disease is a condition of the organism. An harmonious environment, as expressed through sanitary and hygienic influences, is an essential requirement of normal functioning. The influence of these forces upon nerve impulse, circulatory channel and the chemism of the body is basic to the physiologic action. Growth and development exemplify functional action of the organism, and depend upon not only an intact anatomical, but also upon a consonant hygienic and dietetic, environment. Thus upon broad, but nevertheless definite biologic grounds, the health problem primarily deals with the anatomic and physiologic adjustment of cell, tissue and organic environment. It is not a problem of extraneous or foreign stimulation or inhibition, but instead of biologic normalization, of the inherent and complete properties, active and potential, of the vital organism.

The Importance of an Intact Structure.— A diseased condition presents physiologic forces that are at variance from the normal as to time, rhythm, quantity. In other words they are natural forces but not normal forces. The structural mechanism may be distorted or maladjusted by physical forces, as any machine may be, so that order and harmonious action are not forthcoming, or physiologic functioning through environmental change and adaptation may also result in discord. In either instance it is evident that a deranged structure lowers resistance, impairs nutrition and thus predisposes to the many exciting causes of disease; for any condition or force that disturbs nervous equilibrium, vascular equalization or chemical co-ordination produces a definite effect upon the character of organic functioning. Then it is equally evident that rectification of the structural derangement and functional environment is the logical remedy.

The tendency of the organism under all conditions is toward self-repair and physiologic unity. It is manifestly impossible to transfer a vital spark to the organism. Treatment of any kind whatsoever can go no further than a certain guidance or control of its bio-physics and bio-chemistry. This is the beginning and end of therapy; and in order for it to be really efficacious, it must be consonant with these forces, for the reparative and healing powers are inherent qualities.

An organ is an instrument for functioning, and the degree of its mechanical intactness within a definite minimum establishes a certain ratio of normal function. Beyond this minimum, with most organs, there is a superabundance of tissue that may be called the margin of safety. There is not only a superabundance of tissue, but also of mechanism, as instanced, for example, by inflammatory reaction, substitution, vicariation and adaptation upon the part of the various tissues. Thus the completeness of the structural plan, the physiologic inherent properties and, beyond all, the function of self-repair are basic considerations.

The Cause of Disease.—The essential thing in practice is to find the cause of disorder and remove it if possible. Osteopathy's claim to a school of the healing art rests with its establishment of a distinctive etiologic diagnosis of disease. Every school pays allegiance to the rich heritage of common medical knowledge. These facts are many but their value depends upon the interpretation and the use made of them. Osteopathy accepts this data and makes use of it in so far as the verifiable facts are applicable and demonstrable at the bedside. In addition to this, osteopathy presents considerable new material. But it is the osteopathic concept, the principles universally exemplified, that are of commanding importance. Every disease or disorder is in its final analysis a condition of the organism that is not compatible with the normal, must be in accordance with natural law and is scientifically demonstrable if the sequential chain can be elucidated. Osteopathy through its clinical research has clearly demonstrated the mechanistic origin of many disorders. This principle is applicable to every tissue of the body. Every structural derangement of tissue is at least potentially a cause for disease. If a definite order of the structure is an essential to health, then disorder of tissue will, in accordance to natural law, be followed by ill-health. Thus, osteopathically viewed, a fundamental cause of disease rests with the character of the bio-physics. The status of the osseous alignment, especially of the vertebræ which enclose and protect so many vital centres, the character of muscle tonus, the condition of the ligaments and the position and functional development of the viscera are all of basic consideration in the health problem. Conformation, configuration and poise, whether of spinal column, torso, abdomen, pelvis, or of the body as a unified mechanism, and the elasticity and resiliency of tissue, all attest physiologic principles of first importance. The intact anatomical condition exemplifies the primary hygienic law. Any divergence from this intactness is of first consideration to the osteopath.

There are many factors that will disorganize or disarrange the structural mechanism: overfatigue, ill-habits, deleterious environment, insanitary conditions, unhygienic surroundings, dietetic errors, mental disturbance, prolonged exposure to cold or heat, trauma, etc. Traumatic injury is far from being the only cause of maladjustment. An inbalance of muscles, due to fatigue, a slumped posture, cold, etc., are common sources of mechanical derangement. Vital reacting to environment is always expressed structurally, of which abuse and disuse of function are everyday examples. The locality, character, extent, as well as the time factor, of the pathogenic changes are the important features.

These changes initiate a distinctive osteopathic pathology. The stress and strain concomitant with environmental reaction and adaptation, if carried beyond the normal limitations, is certain to disturb physiologic unity with a consequent lowering of tone and resistance of tissue. These are the first changes involving nerve impulse, circulation and chemism of the body. In other words, these are pathogenic factors that antedate and give origin to many well-known symptom groups and morbid states. This condition renders the bodily organism subject to the influences of pathogenic bacteria and other secondary and exciting causative factors of disease. Synchronously with lowered resistance and impaired nutrition a diminished immunity is certain to develop. The initial lesion is frequently a localized maladjustment of tissues that, either through its definite location involves innervation and circulation of a tissue or organ, or through its nutritive impairment favors multiplication of micro-organisms. Owing to the importance of the spinal structures and their functions much attention is given these tissues, although every section of the body is thoroughly examined, both structurally and functionally, in accordance with characteristic osteopathic procedure and the several other scientific methods.

Equally important are the action and freedom of nerve impulses, the character of vascular tissue and its unreserved flow, the integrity of the cerebro-spinal circulation, the unimpeded drainage, the complete elimination, the thorough co-ordination of chemical forces, and, through these, the ability of the organism to establish immunity. All of these are intimately interrelated; in fact, co-ordination and correlation of the organism as a concatenated whole, structurally and functionally is completely expressed by the function of self-repair and the power of the tissues to prevent infection. Historically, osteopathy is the first school to recognize the facts that functional integrity is dependent upon a mechanically intact structure and a harmonious environment and that chemical immunity may be thus established, and, moreover, what is of far greater importance, to actually apply this basic conception to the detailed bodily mechanism in its entirety.

The recognition of a distinct osteopathic etiology and pathology establishes a new and characteristic method of diagnosis, though all scientific methods of diagnosis are recognized and adapted in accordance with the osteopathic concept. The diagnostic characteristics of the osteopathic school are those features that are dependent upon a deranged or maladjusted mechanism — maladjustment of the apposed interosseous tissues, tightening, thickening or laxness of ligaments, and adhesions and various changes in the articular tissues, contraction and contracture of muscles, displacement of organs and the innumerable grosser changes of spinal, pelvic and thoracic conformation — all of which can be shown distinctly to disturb functional integrity, are among some of the principal osteopathic signs and symptoms. Thence, in response to the vital reaction, through the media of nerves, circulation and chemical forces, there follow impairment of bodily equilibrium, of elasticity and resiliency of tissue, of dynamic and static requirements of joint functioning, of organic structure, function and relationship.

Significance of Osteopathic Adjustment. — The body being a complete vital organism endowed with the wonderful function of self-repair, and even with an excess of structure and mechanism, is frequently capable, when disordered, of restoring functional integrity, but in other instances owing to severe or prolonged disturbance of structure or function extraneous aid must be instituted after the manner of structural, environmental, surgical or dietetic adjustment in order that a normal physiologic unity may assert itself — and this is osteopathy. Frequently when the correct osteopathic treatment is applied the commonly accepted natural history of disease is changed. The disorder may be either aborted, lessened or many possible complications prevented. Thus osteopathic prognosis comprises characteristic and distinctive factors. And the possibilities in the field of preventive medicine are greatly increased.

It should be emphasized that osteopathic treatment is neither a routine method nor a movement cure, but instead a definite manual adjustment of the maladjusted parts. Every treatment is as individual as the mechanical problems presented. These problems are innumerable, depending upon character and extent of tissue involved, whether vertebral, pelvic, torso, etc., the many secondary factors that may complicate the disease, and the various inherited and environmental conditions that may predispose or add to the disease picture. The treatment of a disorder is composed of many factors, and commonly speaking the value of a therapy is dependent upon a true evaluation of all the forces and processes that have entered into the production of the diseased condition. The characteristic feature osteopathically is the mechanistic one somewhat paralleled by the adjustment methods demanded in the restoration of any complex mechanism. But in the liberation and rectification of the dynamic forces when the structure is deranged (and that give origin to a morbid state that must necessarily precede the various symptoms or manifestations of disease), by adjustment of the tissues to a point of normalization and by attention to the maintenance of a harmonious regimen, one should not lose sight of the fact that there is something more than can be explained in terms of mechanism though this constitutes the solid groundwork of the biologic sciences. In reality the body is a vital organism.

Discovery of Osteopathy.— Dr. Andrew Taylor Still of Kirksville, Mo., discovered osteopathy. He was born in Virginia in 1828; d. 1917. Dr. Still was educated as a physician and surgeon of the regular school. When the Civil War broke out he was located at Baldwin, Kan., and served as a surgeon to the Northern forces. From an early period he had been a close observer of nature, spending much time and thought in natural history pursuit, and having a decided inclination to inquire into the why of things. In his early life the dissection of animals was of special interest to him which later was followed by the dissection of many human subjects. Anatomy and the laws of nature therein expressed had been for 70 years or more the one commanding interest of his life. This combined with a distinct genius along mechanical lines laid the foundation for the science and art of osteopathy. One of his early inventions is an important part of the reaping machine.

At an early period in Dr. Still's professional career he lost several of his own children from cerebro-spinal meningitis. They had the best attention that medical skill could give. This seems to have been a great stimulus to his future life work. Dr. Still realizing that the doctors had done the best they knew how did not ascribe the tragedy to the inscrutable ways of Providence, but instead, fully believing that the practice of drug medication is basically wrong, set himself the task of discovering if possible a scientific method of therapy. This was the driving and commanding force that later developed into the school of osteopathy.

Dr. Still was a skilled surgeon of no mean ability, particularly as his art pertained to mechanical adjustments of fractures and dislocations. The restoration of function in this class of cases, especially the pronounced effect of these comparatively grosser corrections upon the liberation of vessels and nerves, followed by normalization of tissues, gives an inkling of the restorative properties of nature. This with his commanding knowledge of anatomical structure, particularly from the living or dynamic standpoint, with a decided tendency to investigate and experiment are additional factors that led to his discovery.

The osteopathic discovery came very gradually. In some of the first experiments it was found that pressure on the occipital nerves cures certain kinds of headache; that adjustment of the cervical and dorsal vertebræ will frequently cure goitre; that alignment of the lumbar vertebræ will cure many cases of dysentery; that correction of the spinal joints will be followed by restoration of partially paralyzed nerves of the legs. These with many other similar experiences over a period of many years were the early incidents that led to the discovery of osteopathy.

In the early days of osteopathic investigation Dr. Still arrived at the definite conclusions that disease is largely a condition of the mechanism depending upon the structural status of the tissues, that all remedies for relief and cure are contained within the organism, and that adjustment, normalization of structure and environment represents the remedial law.

In 1874 Dr. Still's discovery was definitely announced. He spent his remaining years in perfecting the idea and making practical that the human organism is a self-reparative and self-recuperative vital organism; that by virtue of these attributes the organism contains, actively or potentially, the essential properties for growth, development, repair and cure; that normal circulation, nervous equilibrium and chemical co-ordination are the essentials of health; and that ill-health is initiated, active or predisposing, by some maladjustment of structure, bone, muscle or other soft tissue or organ, so that vascular tissue, nervous structure or chemical force is impaired. The impairment may be caused by trauma, environment, infection, diet, etc.

Dr. Still writes: "Osteopathy is based on the perfection of Nature's work. When all parts of the human body are in line we have health. When they are not the effect is disease. When the parts are readjusted, disease gives place to health. The work of the osteopath is to adjust the body from the abnormal to normal; then abnormal condition gives place to the normal and health is the result of the normal condition.

"Man cannot add anything to this perfect work nor improve the functioning of the normal body. Disease is an effect only. Man's power to cure is good at least in so far as he has knowledge of the right or normal position, and so far as he has the skill to adjust the bones, muscles and ligaments and give freedom to nerves, blood, secretions and excretions." Dr. Still has constantly emphasized the fact that the "rule of the artery is supreme," and that the beginning of disease is first characterized by interference to complete freedom of vascular channels.

The development of osteopathy has been dependent upon a more complete understanding of living anatomy, a detailed knowledge of every tissue in not only its mechanical relationship, but also of its functional significance. Disease being expressed by anatomical change, accompanied by functional perversion, from the norm, a thorough knowledge of the intact structure is demanded. In order to restore normal completeness of the mechanism, both the statics and dynamics of its component parts and of the mechanism as a whole must first be elucidated. This demands a certain skill of diagnostic ability as well as efficiency of manual adjustment.

Dr. Still says: "To repair signifies to readjust from the abnormal condition to the condition of normal. You as osteopaths can go no farther than to adjust the abnormal condition, in which you find the afflicted. Nature will do the rest. Order and health are inseparable, and when order in all parts is found, disease cannot prevail, and if order is complete and disease should be found, there is no use for order. If order and health are universally one in union, the doctor cannot usefully, physiologically or philosophically be guided by any scale of reason, otherwise.

"If health is perfect, it only proves perfect harmony in the physiological action of the body in all its parts and functions. Any variation from perfect health marks a degree of functional derangement in the physiological department of man. Efforts at restoration from the diseased to the healthy condition should present but one object to the mind, and that is to explore minutely and seek variation from the normal.

"It is only the perfection of the organism and the connected oneness that is the keynote to osteopathic practice. Every part has a duty to perform not only for its own maintenance, but also for the health and harmony of the interrelated whole. This is part of the law of supply and demand, which is absolute through all nature. It is important to know the exact place that each organ and tissue occupies in its normal position. It is only by knowing the normal we are enabled to detect the abnormal. Each organ seems to be a creator of its own fluid substances. We must know the nerve and blood supply and the drainage.

"With anatomy in the normal properly understood, we are enabled to detect conditions that are abnormal. It may be that by measurement we can discover a variation one-hundredth of an inch from the normal, which, though infinitely small, is nevertheless abnormal. If we follow the effects of abnormal straining of ligaments, we easily come to the conclusion that derangements of one-hundredth part of an inch are often probable of those parts of the body over which blood vessels and nerves are distributed, whose duties are to construct, vitalize, and keep a territory, though small in width, fully up to the normal standard of health. My object is to emphasize the importance of looking after local causes that go on with their irritation."

Definite results in practically every field of disease were obtained before any possible laboratory demonstration could be secured, such as the scientific world has to-day, that clearly revealed the biologic integrity and completeness of the vital organism. Dr. Still suggested the antigens in the blood long before any one else, and also anticipated the fact of immunity. Not only did he emphasize the absolute importance of a free flow of pure blood and an unobstructed lymphatic drainage, but also of an uninterrupted nerve impulse as well as the circulation of the cerebro-spinal fluid. All of this he considered as fundamental requirements in order that health may be maintained. These are necessary attributes for self-growth, self-development and self-repair. They establish that a unified whole for every part is reciprocally conditioned.

Coexistent with this are the attributes of a physical mechanism. Vital functions are conditioned and amenable to the structural laws of physics. This fact determines the value of the science of osteopathy — its practicalness. Owing to the structural character of the organism, its definite plan and great complexity much attention is paid to anatomical minutiæ. To adjust mechanically, as the art implies, requires an exact knowledge of structure and its expressed mechanical principles. This naturally enjoins considerable detail knowledge as well as experience and skill.

The term osteopathy is derived from the Greek: osteon, bone; pathos, suffering. This was suggested because the bony framework comprises an important part of the physical body, which frequently becomes maladjusted, resulting in impairment of the organism; and because the bones are used as levers for the adjustment of the tissues.

Legislation.— The legislative history of osteopathy comprises one of its interesting and important chapters. The writer is under obligations to the legislative department of the American Osteopathic Association for considerable of the following material.

Osteopathy received its first legal recognition in Vermont in 1896. In 1897 Missouri, Michigan and North Dakota legalized the practice. Iowa enacted a law in 1898, and South Dakota, Illinois and Tennessee in 1899.

The contention of regular medical practitioners who opposed these laws was that the osteopaths should take the regular medical examination. The evident prejudice against osteopaths of those making this contention was an argument against the fairness of such an arrangement, but it was evident to the public that osteopathy was really a separate and distinct science. Osteopaths were not taking a fundamental part of existing medical practice and calling it by another name just to avoid laws and educational standards, as has been since done as to osteopathy by variously named practices. The course of the early osteopathic college which required 20 months and did not pretend to prepare its graduates for major surgery compared very favorably with the then quite commonly prevailing course of 24 months in medical colleges in which time major surgery also was supposed to be covered. As to its differences from medical belief and practice, as a matter of fact it was so different that such of its fundamental ideas as that vertebræ are often subluxated and cause interference with spinal nerves and produce disease in the organs these nerves supply were ridiculed, at that time, by the medical profession. There was, thus, no confusion in the public mind as to osteopathy being distinctly different from the accepted idea of medical theory and practice and it was given separate recognition.

As new osteopathic schools sprang up over the country, some good, some mere diploma factories, and as the imitators and impostors that inevitably attach themselves to any worthy idea began to distribute themselves throughout the States, it became evident that the earlier laws recognizing osteopathy needed amplification in order that the public might be assured of efficient osteopathy practice and the earlier laws were variously changed and amended to this end.

By way of enacting a law which would be both fair to the osteopathic profession and at the same time raise the profession's standards and ensure the best possible osteopathic services to the public, in 1901, though there were but 13 osteopaths in Montana at that time, the Montana legislature, against the usual medical contention that osteopaths should be regulated by the medical board and persistent plans to bring that about, overwhelmingly sanctioned a bill which provided for a State board of osteopathic examiners. This board was to be composed of three graduate osteopathic physicians to be appointed by the governor of the State and whose duties would be to pass upon the school credentials of all applicants in "anatomy, physiology, chemistry, pathology, obstetrics and theory and practice of osteopathy and such other branches as are taught in well regulated and recognized schools of osteopathy and deemed advisable by the board." This law was the first of its kind.

This form of law having been in consideration by those interested in other States was adopted in the years following in a number of States. Because of its fairness and efficiency in practical administration and its practical possibilities in continuously raising the standard of osteopathic practice and increasing the worth of the service that osteopathic physicians render the public, it has become the most common form of regulating the osteopathic system of practice. It has for years been the law which the osteopathic profession has favored in contradistinction to laws which force the osteopathic practitioner to be examined by boards composed entirely of medical men or even medical boards on which the osteopathic profession is given minor representation.

A recent resolution unanimously passed by the American Osteopathic Association in convention assembled outlines the profession's legislative stand: "That it is the sense of this association that medical examining boards on which osteopathy is given minor representation are not just to osteopathic physicians in their practical administration and that it is impossible for such boards to give examinations which are the most practical test of efficiency. . . .

"We endorse the Independent Board of Osteopathic Examiners as the fairest and most efficient medium for the regulation of osteopathic practice."

Under medical board regulation discrimination has been often practised against osteopathic applicants and justice been such a variable quantity that the osteopathic profession has, because of this, been consistent in asking for separate regulation, but, while this is true, it does not constitute the fundamental reason for the stand which the osteopathic profession has continuously taken in demanding separate regulation and examination of osteopathic applicants rather than regulation which causes osteopathic applicants to be tested by a medical examination given by drug school practitioners. The essential reason for the profession's contention against the latter arrangement is epitomized in the words of the above-quoted resolution,— "it is impossible for such boards to give examinations which are the most practical tests of efficiency." The reason that it is impossible is because of the distinct difference between the education received by an osteopathic physician through the better osteopathic college and the education received by the drug school practitioner through the medical college, a difference existing not in length or thoroughness or practicalness of course, for there the osteopathic college does not suffer by comparison with the average medical college. A difference which lies rather in character of education, the distinctive and definite nature and features of which do not confine themselves to the difference between the instruction in classes in materia medica and drug therapeutics in a medical college and the instruction in the classes in principles and practices of osteopathy which take their place in an osteopathic college. The fundamental distinction antedates the therapeutic phase for it is the etiologic diagnosis of human ailments that controls and determines therapy, and which viewpoint must necessarily permeate all the medical sciences and render a distinctive, definite and harmonious interpretation of existing facts as they pertain to the broad etiologic concept upon which the system is built. Herein is contained the essence of the osteopathic school, and by virtue of its practical efficiency at the bedside the osteopaths claim the rights and privileges to provide for, develop and safeguard its basic principles.

This difference in character of education existing, it is the belief of the osteopathic profession as to State board tests,— that the same State board examination which tests the practical worth and fitness of the drug school practitioner to administer to the public does not and cannot, at least at the present time, best test the practical worth and fitness of an osteopathic practitioner to render osteopathic service to the public and vice-versa.

The prime object of all regulation of the practice of the healing art being to ensure to the public the best possible professional service, the test which does not and cannot ensure this has not conserved its end. As, because of the difference indicated, only those themselves having been osteopathically educated would be qualified to test as to whether an applicant possessed a practical working osteopathic education, the public is best served as to regulation of osteopathic practice by having State board of osteopathic examiners or committee provided.

Osteopathy, "A system, method or science of healing," as it is designated by a number of State laws is now regulated in its practice by all but a few of the States of the Union and by a number of the provinces of Canada. As the osteopathic colleges have continuously raised their standards and length of courses from the 20 months course of the early classes of the parent school to the present uniform four-year course, the various laws regulating the practice at present have come to indicate these increased standards.

The largely predominate form of regulation is the law providing for a State board of osteopathic examiners. These boards are composed entirely of osteopathic physicians. The following States have such boards of examiners: Arkansas, Connecticut, Florida, Georgia, Idaho, Kansas, Louisiana, Maine, Maryland, Michigan, Minnesota, Missouri, Montana, Nebraska, New Mexico, North Dakota, North Carolina, Pennsylvania, South Dakota, Tennessee, Vermont, Washington, the Territory of Hawaii and the province of Saskatchewan.

In the following States, osteopathy is recognized by having representation on the regular medical boards of examiners. The laws in these States are termed composite board laws: Arizona, Colorado, Indiana, Kentucky, Massachusetts, Mississippi, New York, New Jersey, Oklahoma, Oregon, Texas, Utah, Virginia, Wisconsin and Wyoming. California also has osteopathic representatives on the medical board, but the law is otherwise much different from the laws in the last-named list of States. Province of Alberta has a composite board.

Ohio and Rhode Island have osteopathic committees to pass upon the osteopathic applicants. Delaware and West Virginia and also in the province of British Columbia and Alberta the examining board is authorized to call in an osteopathic physician to assist in the examination of the osteopathic applicants, and the law is so constructed that this can be done in Illinois, Iowa, Nevada, New Hampshire, South Carolina and the Territory of Porto Rico, the osteopathic physicians being examined and licensed in these States by the regular medical board. In Alaska the law stipulates there shall be no discrimination against any particular school. In Mississippi, Nevada, District of Columbia, and the Canadian provinces, except Winnipeg, that have not already been named, the practice is permitted, though neither authorized nor prohibited by statute. An adverse statute in Winnipeg is not invoked and the practice is permitted. In England, Ireland, Scotland, France, Germany, Sweden, Italy and South America countries osteopathic physicians are permitted to practice, medical regulations applying only in some limiting features.

Colleges and Organizations.— The parent college, The American School of Osteopathy, Kirksville, Mo., was established in 1892. Since then several other colleges have been founded. The present number includes, in addition to the above: College of Osteopathic Physicians and Surgeons, Los Angeles; Chicago College of Osteopathy; Philadelphia College and Infirmary of Osteopathy; Des Moines-Still College of Osteopathy; Massachusetts College of Osteopathy, Boston; Central College of Osteopathy, Kansas City; and Kansas City College of Osteopathy and Surgery. Upwards of 8,000 students have been graduated.

The minimum requirements for matriculation in the Associated Colleges is: "A diploma from a high school course or its equivalent education, together with satisfactory proof that the applicant is the lawful holder of such diploma and that the same was procured in the regular course of instruction." The course of study in an osteopathic college "shall cover four calendar years of not less than 32 weeks each year, and at least 10 months must have intervened between the beginning of any course and the beginning of the preceding course." The minimum required curriculum is a course of 4,320 hours covering the usual sciences taught in a medical college, but, of course, from the osteopathic concept.

The A. T. Still Research Institute, Chicago, is a scientific organization founded by the profession whose special purpose is the development of the science of osteopathy through laboratory investigation. Its buildings and laboratories are well equipped. Considerable research work has been prosecuted along osteopathic lines, which is from time to time published in bulletin form. An important part of the work to date has been experimental verification of the osteopathic lesion, the functional and organic effect of maladjusted structure, on animals. This has clearly demonstrated that structural perversion compromises organic integrity.

The American Osteopathic Association is the national organization, comprising several thousand members. Annual conventions are held. The Association publishes a monthly scientific journal, and a monthly popular journal, both devoted to the advancement and development of osteopathy. Each State and many of the cities have thoroughly established local societies.

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Carl P. McConnell, D.O.,
Late Chairman Department of Education, American Osteopathic Association.

OSTEOSTRACI. See Ostracophores.

OSTERHAUS, ŏs'tẽr-hŏus, **Hugo**, American naval officer: b. Belleville, Ill., 15 June 1851. He was graduated (1870) at the United States Naval Academy and rose in successive promotions till he became (1901) commander, captain (1906) and rear-admiral in 1909. After serving in the several squadrons he was appointed to the Naval Academy (1892–95, 1897–99 and 1901–03). He commanded the *Cincinnati* from 1904–05, was member of the board of inspection and survey (1905–07), commanding the second division, Atlantic fleet (1910) and commander-in-chief Atlantic fleet (1911). In 1913 he was retired.

OSTERHAUS, Peter Joseph. German-American military officer: b. Coblenz, Germany, about 1823; d. Berlin, Germany, 4 Jan. 1917. He emigrated to the United States and at the outbreak of the Civil War joined the Union army in which he was given rank as major of volunteers, subsequently attaining the rank of brigadier-general, and serving as chief of staff under Gen. Kirby Smith. He acted as United States consul at Lyons, France, after the war, but ultimately returned to Germany, where he engaged in manufacturing business. At the time of his death he was the oldest pensioner of the American army.

OSTERHOUT, ŏs'tẽr-hout, **Winthrop John Vanleuven**, American botanist: b. Brooklyn, N. Y., 2 Aug. 1871. He graduated (1893) at Brown University and was instructor of botany there from 1893–95, teaching botany also at Woods Hole, Mass., 1894–95. He studied (1895–96) at the University of Bonn, then returning to America as instructor (1896–1901), assistant professor (1901–07) and associate professor (1907–09) at the University of California. He was assistant professor of botany (1909–13) at Harvard University, then becoming professor. He has written ‘Experiments with plants’ (1905); ‘Agriculture for Schools of the Pacific Slope’ (1909), in collaboration with E. W. Hilgard, besides many contributions to the botanical and bio-chemical periodicals.

OSTIA, ŏs'tĭ-ạ, Italy, an ancient city of Latium, formerly the port of Rome, at the mouth of the Tiber, six miles from Rome by the Via Ostiensis. It was founded by Ancus Martius in the 7th century B.C., who established salt-works at its site, which long continued to supply Rome and the neighborhood. Ostia also supplied Rome with corn from Sicily and Sardinia. It was not, however, till the wars with Carthage rendered it of importance as a naval station that it appears in history. From Ostia Claudius sailed on his expedition to Britain, and it was a favorite resort of the Emperor Nero.

The decline of Ostia appears to have been due to the constant filling up of the river, from which its site is now two or three miles distant. Claudius constructed a new harbor with great labor about two miles north of Ostia, which communicated with it by a canal. It was called the Portus Augusti, and afterward, when enlarged by Trajan, the Portus Trajani. The new port became the seat of a town called Portus Ostiensis or simply Portus. It communicated directly with Rome, and soon began to encroach on the trade of Ostia, which, however, continued to flourish until its destruction by the Saracens in the 9th century. Its ruins are about half a mile below the modern village, founded by Gregory IV in 830, and strongly fortified, which is now a place with about 1,000 inhabitants. The ruins of Portus are on the right bank of the Fiumicino, about two miles from the coast.

Modern excavations at both places have revealed a number of interesting remains of ancient public buildings, temples, shrines and tombs. An electric tramway connects with Rome. Consult the article on the excavations by Professor Dante Vaglieri in the *Cosmopolitan Magazine* for March 1912.

OSTIAKS, ŏs-tĭ-äks', a primitive Finnish race who dwell in the Siberian governments of Tobolsk and Tomsk. They consist of three tribes, distinguished from each other by customs and language and live almost exclusively by fishing. Their language, of which the dialects are numerous, is classed as a branch of the Samoiedic, a language of Turanian stock. At present their aggregate amount may be estimated at 30,000. Christianity has made some headway among them, but the old superstitions have been fused with it. Of uncertain origin, though possibly Mongolian stock, are the Siberian Yenisei Ostiaks, on the Yenisei, between the Upper and Lower Tunguska. They speak an entirely different language from all the other Ostiaks, and for a long period have completely adopted Mongolian customs.

OSTIARIUS (door-tender), one of the four minor orders in the Catholic Church, the other three being lector, exorcist and acolyte. It is definitely mentioned as early as 251, and the form of ordination, with the symbolic delivery of the church keys, was fixed before the 6th century. The duties are those commonly associated with the sacristan. The four minor orders are now usually conferred on the same day, being preceded perhaps by a year by the ceremony of conferring the tonsure and followed by the separate ordinations to the subdiaconate, diaconate and priesthood.

OSTRACISM (Gr. *ostrakon*, shell), an ancient mode of judgment by which, according to the Athenian law, a citizen was consigned to banishment. It was not a punishment for any offense actually committed, but a precaution against the projects of personal ambition and the excessive growth of individual power and influence. When it was decided by the popular assembly and senate that a citizen should be banished, no name being mentioned in the preliminary discussion, the voting took place in the following manner: A place in the *agora* was enclosed by barriers, with 10 gates for the 10 tribes. By these the voters entered and deposited their votes, written on a shell or piece of tile. The archons counted the votes, and the person against whom the plurality was given, provided there were more than 6,000 votes, was obliged to leave the city within 10 days. The period of banishment was usually 10 years. Ostracism did not include forfeiture of property and was not considered a disgrace. Among the distinguished persons ostracized were Themistocles, Aristides and Cimon, son of Miltiades. Similar methods of procedure existed in Argos, Megara, Miletus and Syracuse. Ostracism seems to have been introduced to Athens by Cleisthenes (q.v.) in 510 B.C., but not to have been used until it was employed against Hipparchus in 488-487 B.C. Consult the various histories of Greece and Busolt, G., 'Die Grieschische Staats-und Rechtsalterümer' (2d ed., Munich 1892); Gilbert, 'The Constitutional Antiquities of Athens and Sparta' (tr., London 1895).

OSTRACODA, an order of *Entomostraca* or small *Crustacea* (qq.v.), in which the body is unsegmented and completely enclosed in a bivalve shell or carapace. The shell is attached to the body only on the dorsal side, where there is an elastic divaricating ligament whose action is opposed by an adductor muscle. When the valves are opened seven pairs of appendages are exposed. These are two pairs of antennæ, a pair of stout chewing mandibles, two pairs of maxillæ and two pairs of locomotory legs. All of these appendages except the mandibles are more or less concerned with swimming and creeping. Besides tactile organs there is a median eye and sometimes a pair of eyes. The sexes are always separate. Sometimes the eggs are carried within the female's shell, but usually are deposited on water plants. The young pass through a nauplius stage with three pairs of appendages, but are peculiar in the presence of a bivalve shell. Numerous species inhabit both fresh and salt waters and many are known in the fossil state, being first found in the Cambrian strata, reaching their zenith in Ordovician times, and assuming their modern forms in the Cretaceous. The most frequent are the species of the fresh-water genus *Cypris* (q.v.), lively little animals found in great numbers in ponds and aquaria. *Cypridina* is marine, and has the shell excavated in front to permit the passage of the very prominent antennæ. It has both paired and median eyes and a large heart. Consult Packard, 'Zoology' (1897); 'Cambridge Natural History' (Vol. IV, London 1909).

OSTRACODERMI, a suborder of plectognath fishes, according to the classification of Jordan (see ICHTHYOLOGY), composed of the trunk-fishes, puffers, porcupine-fishes and their allies, which have the body "inclosed in a three-, four- or five-angled box or carabace, formed by polygonal bony scutes, firmly jointed at their edges," and are without a spinous dorsal fin.

This term has also been used as a synonym of Ostracophori (see OSTRACOPHORES).

OSTRACOPHORES, a subclass of small fishes (*Ostracophori* or *Ostracodermi*), composed of very early Palæozoic forms with persistent notochord and endoskeleton not calcified; mandibles and true paired fins are apparently absent. The exoskeleton was well developed and the head and anterior portion of the trunk was usually covered with plates, which in many form solid and extensive shields, making the fish look much like a horse-shoe crab; indeed the remains of many were at first mistaken for those of crustaceans, arachnids or even gigantic beetles. The mimicry of the contemporary eurypterids (see EURYPTERUS) was very close. Louis Agassiz first recognized them as fishes. None of these fossils exhibit the slightest trace of ordinary jaws, or of a segmented axial skeleton in the trunk, or arches for the support of paired limbs. The dermal armor is remarkable for the extent to which vascular spaces are developed in its middle layer; in the oldest and simplest forms no bone-cells have been found in any part of the armor. There is always a shield covering the top of the head, and usually another over the abdominal region; and opposed to the latter is a ventral armature which meets the dorsal plate at each side in an open suture. The tail seems always to have been flexible, though scaly in some species. The mouth, according to Woodward, must have been on the ventral side, with the nasal sac or sacs just in front of it. The gill-pouches opened outwardly into a covered space communicating with the exterior by a posterior orifice. Eyes are distinct, and other cephalic organs, as ears, and a pineal eye may be inferred from impressions in the interior of the head-plates. Traquair regards certain discoveries as showing some close relationship between ostracoderms and primitive sharks. Gaskell and Patten, in very different ways, consider the ostracophores as stages in the development of the vertebrates (q.v.) from the eurypterids.

Four orders are recognized in the class. The oldest and simplest is the *Heterostraci,* represented by the family *Pteraspidæ,* whose species occur in various parts of the world in formations from the later Silurian and early Devonian ages. The hard shield in these fishes, some of which were a foot in length, is formed of a few plates, well fused in the adult, each plate of which is unlike anything else in the *Chordata,* for it consists of three layers,— an inner or nacreous layer of lamellæ, a thicker middle layer of polygonal cancellæ and an outer layer of dentine. Dermal sense-organs are well developed and arranged in canals within the middle layer, opening externally by a double series of pores. *Pteraspis* and *Cyathaspis* are well-known genera. Associated with this group by Traquair and Zittel-Eastman on later information are the family *Cœlolepidæ,* formerly considered sharks; and the more familiar *Psammosteidæ,* which extend the range of the group into the Upper Devonian. A second order, *Anaspida,* consists of a few species ornamented outwardly with tubercles, but no armature of fused plates. The third order, *Aspidocephali,* or *Osteostraci,* consists of many forms found in the Upper Silurian and Lower Devonian, and especially in the Scotch Old Red Sandstone, which have a broad solid head-shield, consisting of three layers, the outer or hard vaso-dentine; the body of these fishes were covered with quadrangular scales; they had no paired appendages, but moved by means of a small dorsal fin and the heterocercal tail. This group is one of those most studied by Hugh Miller, Murchison and other early geologists, and has been the object of special treatises by Huxley, Lankester, Brandt, etc. *Tremataspis* is a genus representing an allied family.

A fourth order, *Antiarcha,* contains that remarkable form *Pterichthys* and allied genera of the family *Asterolepidæ.* These were small fishes of robust form, the head and forward parts heavily armed with large tuberculated plates united into a solid buckler by lateral plates. The hinder part of the body, small fleshy dorsal fin, set near the tail and the heterocercal tail itself are covered with small scales, except in the finny portions. The most extraordinary feature in this curious primitive fish were the paddle-like appendages, closely resembling in shape and action the flippers of a marine turtle, which were articulated by a complex joint just behind and beneath the corners of the mouth and were completely armored. They formed swimming organs analogous, but not homologous with the pectoral fins of later fishes. These and their allies, *Asterolepis, Bothriolepis,* etc., are found in the Devonian rocks of both Europe and North America. Consult Gaskell, W. H., ‹The Origin of the Vertebrates› (1908); Patten, W., ‹The Evolution of the Vertebrates and their Kin› (1912); Woodward, ‹Vertebrate Paleontology› (1898); Zittel-Eastman, ‹Textbook of Paleontology› (Part II, 1902); Traquair, ‹Fossil Fishes . . . in the Silurian Rocks of the South of Scotland› (1899). See ICHTHYOLOGY.

OSTRICH, a great African running-bird (*Struthio camelus*). The ostriches constitute a genus (*Struthio*) and a family (*Struthionidæ*), of the group Ratitæ (q.v.), characterized by having but two toes, the third and fourth, of which the former is much the larger and bears a short hoof-like nail; an almost equally unique internal feature is the symphysis of the pubic bones. The ostrich is by far the largest of existing birds, attaining a height of seven to eight feet and a weight of 300 pounds, and was exceeded by only a few more or less closely related extinct ones. There are no true down feathers, but the contour-feathers are soft and lax, with free barbs and no aftershaft and are distributed uniformly over the skin without any arrangement into pterylæ and apteria. On the body the plumage is black or blackish, with the quill plumes of the wings and tail white; the head and neck are nearly, and the legs quite, naked. The head is remarkably small for a bird, the eyes large and the beak flat; the horny covering of the latter is peculiar in being composed of several pieces separated by soft skin, instead of being continuous as in most birds. The gape is straight and reaches to a point beneath the eye. The absence of functional wings and tail, the elevated back, the stout, column-like legs with padded toes, the long, erect, curved neck and the great size, all combine to produce a very unbird-like asnect and to give a peculiar appropriateness to the name «camel-bird,» applied to the ostrich by old writers.

Formerly the ostrich was abundant throughout Africa and a great part of the southern half of Asia. In the latter region it is now restricted to a few of the more inaccessible deserts, and in Africa is no longer found in the wild state, in Egypt or near the northern and southern settlements, but is still abundant throughout the intervening territory wherever sufficiently extensive and solitary wastes exist. Some zoologists consider that but a single species ranges over this whole vast territory; others — and this is the prevailing opinion at present — have distinguished three: *Struthio camelus* of northern Africa, *S. australis* of southern Africa and *S. molybdophanes* of Somaliland. In the first the naked parts of the skin are pink, in the second bluish and in the last lead-colored; the eggs of the first have a surface of ivory-like smoothness, in the other two they are pitted. Wherever abundant, ostriches live on the plains in association with zebras, hartebeestes, gnus, etc. Like these animals they are extremely alert and wary as well as timid. So fleet are they that even the Arab on his blooded steed can seldom overtake one single-handed, and even when hunted in relays, as the birds circle about their favorite territory, one or more horses are frequently sacrificed to the chase. When in full flight a full-grown ostrich is said to cover 25 feet at a stride. They are also captured for the sake of their plumes by means of pitfalls, shooting with poisoned arrows and in other ways. During the breeding season they form family parties consisting of one male and several females. The latter deposit their eggs to the total number of 50 or 60 in a shallow depression surrounded by a slight rampart of earth. Many of the eggs are broken, some of them to be devoured by the male, others to supply soft food to the young so that the brood of young seldom exceeds 20 or 30, many of which fall a prey to carnivorous animals. The male exclusively incubates at night, while during the day the females take turns in guarding the nest or incubating the eggs. During the breeding season the male protects his family faithfully and if driven to extremities fights viciously, kicking sideways or directly forward so powerfully that men and even horses are reported to have been killed by the blows. Although herbage is their chief food, everything edible is eaten, and their habit of swallowing every kind of hard object, just as other birds do gravel, to complete the grinding apparatus of the gizzard, has given to the digestive capacities of the ostrich a wholly undeserved notoriety. They are very fond of water and bathe when opportunities offer.

Domestication of the Ostrich.—Although the flesh is but little used, the eggs of the ostrich are much esteemed for food by native Africans, and their shells serve a useful purpose in the construction of vessels and implements. But it is their plumes which have given a mercantile value to ostriches from ancient times till now. To furnish a ready supply as the wild birds became scarcer in accessible regions, domestication has been resorted to. This is said to have been practised by native tribes for many years, and about the middle of the last century was begun by the French in Algiers and the English in Cape Colony. In the latter place there are said to be now upward of 300,000 domesticated ostriches, yielding an annual revenue of $5,000,000. Ostrich farming in the United States is still in its infancy, but promises to become an important industry. The first experimental importation of ostriches was made into California in 1882, and at the present time about 1,500 of these birds are to be found on the pioneer ostrich ranches of California, Arizona, Texas and Florida. Large, level, grassy fields are enclosed by strong high fences, to form corrals in which the general flock runs. The breeding birds are separated in pairs or sets of one cock and two hens in smaller pens. A single pair will sometimes produce as many as 35 young, the average loss of which is as low as 10 per cent in California, but much higher in Arizona. By the removal of the eggs as soon as laid and rearing them in incubators the output is much increased. In Africa a single trio of birds has been known to produce 188 eggs, from which 133 young were raised in a single year. The chief sources of loss are injuries by the parent birds, cold, dry food, and in Africa an infectious disease. The newly hatched young are the size of a full-grown barnyard hen, and when well fed increase in height so rapidly that by the end of six months they nearly equal their parents. At first they are sheltered at night in brooding boxes, but are turned loose during the day to feed on green alfalfa or other succulent plants, which are, with an abundance of water, their nearly exclusive diet. Dry food is very likely to cause fatal digestive disturbances in the young. The old birds require but little care and are fed on any vegetable matter, but principally upon chopped beets, cabbage, oranges and corn. The plumes from the wings and tails of the fully grown birds are the most valuable and are cut or plucked once or twice a year, each bird yielding about $50 worth annually on the American ranches, but very much more than that on the African farms. When the American stock has become thoroughly acclimated this industry will probably yield rich returns, as some of the South African farms are reputed to pay 40 per cent net profit on the investment. Experiments in ostrich breeding are being tried in Mexico, Central and South America.

Consult Mosenthal and Harting, 'Ostriches and Ostrich Farming' (1877); Martin, 'Home Life on an Ostrich Farm' (1891); Duncan, Report United States Department of Agriculture for 1888.

OSTRICH FERN, a genus (*Pteretis*) of ferns of the family *Polypodiaceæ*. The best-known species (*P. struthiopteris*), a native of Europe, has fertile fronds which resemble ostrich plumes; its sterile ones, which often attain a height of 10 feet, form a handsome vase-like mass of foliage. It may be readily propagated from offsets and is one of the most easily cultivated native ferns. *P. nodulosa*, the American species, is a similar plant.

OSTROGORSKI, ŏs′trō-gô′skĭ, **Moisei Ikovlevitch**, Russian political scientist: b. Grodno, Russia, 1854. He was educated in Russia and in France and was elected member of the first Russian Duma. He made a close study of the American political system and in 1889 published articles on this subject in *Annales des Sciences Politiques*. He published later in French his authoritative and exhaustive work, 'La démocratie et l'organisation des partis politiques' (2 vols., 1903). Of this work Frederick Clarke published an English translation, to which James Bryce furnished a preface (2 vols., 1902; 2d ed., 1908). In 1910 the second volume appeared in slightly altered form under the title 'Democracy and the Party System in the United States.' He also wrote 'La femme au point de vue du droit public: Etude d'histoire et de législation comparée' (1892; English translation entitled 'The Rights of Women: A Comparative Study in History and Legislation' (1893).

OSTROGOTHS, ŏs′trō-gŏths, a people of the Gothic race who lived at a very early time in the region between the Don and the Dniester and the Black Sea and the headwaters of the Volga. They were conquered by the Huns 375 A.D. In 479 they under Theodoric crossed the Alps into Italy, which they completely conquered; in 552 they were themselves signally defeated and Italy became a part of the Byzantine Empire, the Ostrogoths as a separate nation then ceasing to exist. See GOTHS.

OSTROLENKA, ô′strō-lyĕn′kạ, Russian Poland, district town in the government of Lomzha, on the Narev, junction of the Lapy-Malkin and the Ostrolenka-Piljava railways. It was founded in 1427, was the scene of the victory (1807) of the French under Savary over the Russians, also of the victory (1831) of the Russians under Diebitsch over the Poles under Skrzynecki. During the recent World War this town changed from Russian to Teuton occupation several times. Its inhabitants in 1910 numbered 15,985, the majority being Jews.

OSTROVSKI, ŏs-trôf′skē, **Alexander Nikolayevitch**, Russian dramatist: b. Moscow, 12 April 1823; d. on his Kostroma estate, 14 June 1886. He studied at the Moscow Gymnasium and University and, before obtaining his law diploma, was appointed registrar of the Commercial Court. Here he gained a close acquaintance with the local commercial world, its manners, traditions and viewpoints in their mediæval condition. And his plays relate chiefly to the conflicts, culture and education of this isolated Russian body of merchants. His first work (1847) was 'Scenes from the Life of Samoskvoretshi,' a Moscow city quarter. This was followed by his best comedy, 'We Can Settle with Our Own People.' He was a writer of considerable power and originality and added many perfect and vivid life types to the repertoire of Russian comedy. Others of his best works are 'The Poor Bride' (1852); 'Poverty is no Cause for Shame' (1854); 'A Lucrative Situation' (1857); 'The Storm' (1860), a drama; 'A Warm Heart' (1869). He did a clever translation of Shakespeare's 'The Taming of the Shrew' as well as several of the pieces of Cervantes. His collective works have been published in 10 volumes (Saint Petersburgh 1885; 9th ed. with biography by A. Nos, Moscow, 1890; later ed., 1896). (See STORM, THE). Consult Patouillet, J., 'Ostrovski et son théatre' (Paris 1912).

OSTWALD, ōst′vạlt, **Wilhelm**, German chemist: b. Riga, 2 Sept. 1853. He studied, from 1872, at Dorpat, becoming (1875) assistant in the physical institute of the university and teaching, from 1877, as privat-docent. He was made (1881) professor of the Riga Polytechnikum and was appointed (1887) professor of physical chemistry at the Leipzig University. On the institution of the German-American exchange of professors he was the first (1905–06) appointed to Harvard. His first work was devoted chiefly to problems of chemical affinity, and he is considered the leader in modern chemico-physics. Of special importance is his research into electric conductivity of the organic acids, the parallelism between electrolytic dissociation of these acids and their powers of reaction. Other subjects investigated by him are the color of ions, catalysis, galvanic potential differences, etc. He has written ‘Lehrbuch der allgemeinen Chemie’ (Leipzig 1885–88; later ed., 1903); ‘Grundriss der allgemeinen Chemie’ (ib. 3d ed., 1899); ‘Elektrochemie’ (ib. 1894–95); ‘Vorlesung en über Natur philosophie’ (ib. 1902; 3d ed., 1905); ‘Conversations on Chemistry’ (1905–06). He founded the ‘Klassiker der exakten Wissenschaften,’ a collection of reprints of the old treatises on fundamental laws (1889, 150 numbers). He also has published *Zeitschrift für physikalische Chemie* (Leipzig 1887), in collaboration with van't Hoff, and since 1901 *Annalen der Naturphilosophie* (ib.). Consult Walden, ‘Wilhelm Ostwald’ (Leipzig 1904); Slosson, E. E., ‘Major Prophets of Today’ (Boston 1914).

OSUNA, ō-soo'nä, **Pedro Tellez y Giron**, Duke of, Spanish soldier: b. Valladolid, 1579; d. castle of Almaceda, 1624. His caustic and satiric wit twice forced him to leave the Spanish court, to which he returned through the favor of the Duke of Lerma, after distinguishing himself in the Netherlands. He opposed the expulsion of the Moors, thus bringing upon himself the charge of religious infidelity. In Sicily, where he was viceroy (1611–15) and in Naples, where he held the same position (1616–20), he did much for the improvement of the common people, but was an enemy of the clergy in general and of the Inquisition in particular. He probably aimed to build up an Italian kingdom for himself, and in 1620 was recalled, arrested, subjected to a three years' secret trial and imprisoned in the castle of Alameda, where he poisoned himself.

OSWALD, ŏz'wạld, **Saint**, king of Bernicia, in Northumbria, England, from 634 to his death, 5 Aug. 642. His father, Ethelfrith, had been one of the most powerful of the Saxon monarchs, but on his death the kingdom was overrun with invaders and Oswald, his son, was banished and took shelter among the Scots in Iona. Here he became converted to Christianity, which he resolved should be the religion of his kingdom. In 636 he recovered the throne of Northumbria and requested the monks of Iona to send missionaries for the conversion of his pagan subjects. In response Aidan came with a band of missionaries and established himself as bishop in the island of Lindisfarne. In a few years the whole north of England was converted to the faith. Meanwhile Penda, king of Mercia, was persecuting the Christians, and at length declared war on Northumberland. A battle took place at Masetfelth, and Oswald was slain. His severed head was recovered and carried to Lindisfarne, and that and other relics were finally deposited with Saint Cuthbert's coffin in Durham Cathedral. He was canonized as a king and martyr, his festival being celebrated 5 August. Consult Churton, ‘History of the Early English Church.’

OSWALD, Eleazer, American soldier and journalist: b. in England, 1755; d. New York, 30 Sept. 1795. He came to America in 1770 through sympathy with the patriot cause. In 1775, under Benedict Arnold, whose secretary he became, he served as captain at Ticonderoga and also at Quebec, where, Arnold being wounded, Oswald took command with great efficiency. In 1777 he rose to the rank of lieutenant-colonel. He engaged in the business of printing and publishing in Philadelphia and in New York, and politically was in violent opposition to Hamilton and the Federalists. He afterward entered the French army, in which, at the battle of Jemappes, he commanded an artillery regiment. The French government sent him on a secret mission to Ireland, after performing which he returned to New York.

OSWALD, Felix Leopold, American naturalist: b. Namur, Belgium, 6 Dec. 1845; d. 27 Sept. 1906 He was graduated from the University of Brussels in 1865 and studied later at Göttingen and Heidelberg He became a physician; later abandoned the practice, came to the United States and devoted himself to natural history. He published ‘Summer-Land Sketches’ (1880); ‘Physical Education’ (1882); ‘Days and Nights in the Tropics’ (1887); ‘The Bible of Nature’; ‘Body and Mind’; ‘Zoological Sketches’; etc.

OSWALD, Richard, British diplomat: b. Scotland, 1705; d. 1784. He spent several years in America and after his return to England engaged in mercantile pursuits in London. At the close of the War of the Revolution, Oswald, because of his especial knowledge of American conditions, was selected by the Earl of Shelburne as one of the English envoys to negotiate the Treaty of Paris. Oswald was very well disposed toward the new nation and even favored the cession of Canada to the United States. He also furnished bail to the amount of £50,000 for Henry Laurens.

OSWALD VON WOLKENSTEN, ōs'vạlt fŏn vōl'kĕn-stīn, German poet: b. Gröden, 1377, of Tyrolese nobility; d. 2 Aug. 1445. His was a very active, irregular and adventurous life. Already at the age of 10 he was wandering over the world; he traveled over all Europe and the Orient as far as Persia and Arabia. From 1400 he was in his native land, engaged in fighting landowners and other feuds. He met great vicissitudes, spending some time in prison. He accompanied, from time to time, the campaigns, serving under Emperor Sigmund especially. His poems relate largely to these episodes and show many weaknesses, such as in metric construction, style, etc., but they are of a similar character to other 15th century productions. His poems were first published by Weber Innsbruck 1847). A large edition was brought out by Schatz and Koller in *Denkmälern der Tonkunst in Oesterreich* (Vienna 1902), later a smaller work by Schatz (Göttingen 1904). Schrott made translations (Stuttgart 1886). Consult Weber, B., ‘Oswald von Wolkenstein und Friedrich mit der leeren Tasche’ (Innsbruck 1850); Zingerle, ‘Oswald von Wolkenstein’ (Vienna 1870).

OSWEGATCHIE, ŏs-wẹ-găch'ĭ, **Fort**, a former French fortification near Ogdensburg, N. Y. It was also called Fort Présentation and Fort La Galette. In 1760 it was taken by the British and called Fort William Augustus.

OSWEGO, ŏs-wē'gō, Kan., city and county-seat of Labette County; on the Neosho River and the Missouri, Kansas and Texas and the Saint Louis and San Francisco railroads, 132 miles south-southeast of Topeka. The river furnishes excellent water power and there are a number of mills, including flour-mills. It is also the centre of a grain and live-stock region, and there is some coal in the vicinity. A public library is maintained by the Library Association. Pop. 2,317.

OSWEGO, N. Y., city, port of entry, county-seat of Oswego County, on Lake Ontario at the mouth of the Oswego River and at the northern terminus of the State Barge Canal. It is on the Delaware, Lackawanna and Western, the New York, Ontario and Western and the New York Central and Hudson River railroads, about 35 miles north by west of Syracuse. Oswego was founded in 1724 as a trading post and military station. It was incorporated as a village in 1828 and in 1848 was chartered as a city. It was one of the most important places on Lake Ontario and in wars which took place along the northern frontier it was always considered a vantage ground and its possession was contested. In the French and Indian War and King George's War, Colonel Mercer built here two forts, strong for the times, 1755. In August 1756, the place was captured by General Montcalm, who destroyed the forts. This capture of Oswego was considered one of the important events of the French and Indian War. About 30 men on each side were killed or wounded and 1,690 of the British were taken prisoners. Oswego was made the centre of the military operations along the lake and, in the year 1759, General Amherst started from this place with a force of 10,000 men, for Quebec where Wolfe was in command. Oswego was the meeting place, in 1766, between Sir William Johnson and Pontiac, and at this meeting the latter submitted to the British. In the War of 1812 this place was again a disputed point. Its good harbor was always an attraction. On 6 May 1814 a British force attacked the place and captured it. After peace was restored, the place prospered and grew steadily as an important lake port and a shipping point for the products of the rich farms of the vicinity. When the West began to develop as a wheat country and the grain was at first sent East to be manufactured into flour, Oswego was one of the chief points of manufacture and reshipment. The grain elevators and flour-mills were then prominent features along the river and canal. The opening of the flour-milling industry in the West, near the wheat-fields, deprived the city of its great industry, from which loss it did not recover for years. The excellent water power was finally used for manufacturing other products and the city has now a large starch factory, machine-shops for oil-well supplies, boiler and engine works, knitting-mills, car-spring works, match and cigar factories, shade cloth mills, pump works, also manufactories of tools, glucose, gears and underwear and breweries. The lake trade has increased and the city exports manufactured goods, farm products and fruit. The harbor, with its outer and inner haven, which can accommodate large steamers, has been so improved that the quantities of coal, lumber and grain brought here for reshipment can be handled with great rapidity. The exports total nearly $4,000,000 yearly and the imports about $1,500,000. The beautiful parks, the drives, especially near the lake and along the river, fine residences and grounds, all make an attractive city. Some of the places of interest are the old Fort Oswego (q.v.), the present Fort Ontario, which overlooks the harbor, the government building, the State arsenal, the court-house and city hall. Oswego is noted for its State normal and training school, founded by Edward Austen Sheldon. It has fine public and parish schools, a home for the destitute, two orphan asylums and the Gerrit Smith Library. The government is administered under a charter of 1896 which provides for a mayor, who holds office two years, and a council. The waterworks are owned and operated by the municipality. Pop. 25,434.

OSWEGO, a river in New York, formed by the junction of the Oneida and Seneca rivers in the northern part of Onondaga County and flowing north by west enters Lake Ontario at Oswego It is 24 miles long and has a fall of 120 feet from its source to the lake. By means of a canal and locks, the river has been made navigable some distance from its mouth.

OSWEGO, Fort, the name of the fort built by the French about 1724, on the site of what is now the city of Oswego. Later Fort Ontario was built on the opposite (right) of the Oswego River. See OSWEGO.

OSWEGO BASS, the large-mouthed black bass. See BASS.

OSWEGO TEA, a name given to several species of labiate plants of the mint-like genus *Monarda*, particularly *M. fistulosa* and *M. didyma*, natives of North America, because of the occasional use of an infusion of the dried leaves as a beverage. The infusion is said to be useful in intermittents and as a stomachic. Some other species of *Monardo* are used in the same way and are not uncommonly cultivated in gardens for ornament, where they are sought by bees.

OSYMANDYAS, ŏs-ĭ-măn'dĭ-ạs, Egyptian king, said by Greek writers to have reigned during the period between Menes and Mœris, and to have invaded Asia with a great army, penetrating as far as Bactriana. According to Diodorus, on his return he erected great works at Thebes, among which was a monument of unequaled magnificence, the Osymandeion, but this is supposed to be identical with the Rameseum on the west bank of the Nile at Thebes, built by Rameses II, with whom, however, there is much difficulty in identifying Osymandyas himself, whose exploits appear to be mostly of a fabulous character. Consult Diodorus, i, 47–49; Tzetzes, 'Chiliades,' iii, 892; iv, 620; Budge, 'A History of Egypt' (1902).

OTAGO, ō-tä'gō, New Zealand, a southern provincial district of South Island, bounded west, south and east by the Pacific, and on the north by Canterbury and Westland. Area 25,487 square miles. Mountains rise in the west to 6,000 feet; the south and east are agricultural; the orchards in the central portion produce apricots, peaches and grapes. Gold is the principal mineral. The capital is Dunedin, other towns are Port Chalmers, Oamaru, Invercagill, etc. Otago was settled in 1848 by a body of Scotch Free Churchmen. Pop. (estimated 1916) 206,622. See New Zealand.

OTAHEITE, ō-tä-hē'tē or ō-tä'hē-tē, an island in the Pacific Ocean, now known as Tahiti. See Tahiti.

OTALGIA, earache; specifically neuralgia of the ear. Its attack is usually sudden, the pain coming on at once with full intensity. It is often associated with other ailments, of which it may be only a local symptom, and frequently arises from disorders of the teeth. Neuralgic pains in other parts of the face often follow it. When otalgia is very intense it extends to the temple and nerves on the same side of the face, in which it causes acute pains. It frequently departs suddenly and returns again generally to the same ear. The treatment when the disease is symptomatic must depend upon the cause. Ordinarily earache is due not to otalgia, but to otitis media, or inflammation of the middle or tympanic portion of the ear.

OTARU, ō'tä-roo, Japan, the chief town on the west coast of Hokkaido on the south shore of Ishikari Bay and connected by rail with Sappora and the coal region of Ishikari. There is a fine breakwater and sheltered harbor, and a marine experimental station. It has important herring and other fisheries and a large trade. Interesting archæological remains have been found in the vicinity. Pop. 91,000.

OTAVALO; ōt-ä-vä'lō, Ecuador, town, province of Imbabura, 25 miles northeast of Quito. It was settled in 1534; in 1868 it was completely destroyed by an earthquake and many of the inhabitants were killed. Since then it has been well rebuilt and has several mills manufacturing cotton and woolen goods. Pop. about 8,600.

OTCHAKOFF, ŏ-chä'kŏf, Russia. See Ochakof.

OTERO, Miguel Antonio, public official: b. Saint Louis, 17 Oct. 1859. He was educated at Saint Louis University and Notre Dame University, Indiana; and became city treasurer, Las Vegas 1883–84; clerk San Miguel County 1889–90; clerk of the United States District Court, 4th Judicial District of New Mexico 1890–93; governor of New Mexico 1897–1906; treasurer of New Mexico 1909–11; president board of penitentiary commissioners and parole board 1913–16. He was a delegate to the Republican National conventions 1892, 1900, 1904, 1908; chairman New Mexico delegation 1900, 1904; chairman New Mexico delegation Progressive National Convention 1912. He is officer or director in several large business enterprises.

OTERO, Rafael, Cuban dramatist: b. Havana, 1827; d. there, 1876. His first comedy was performed so early as 1842. Several others were afterward presented at Matanzas and Havana, among them ‘El Coburgo,’ ‘Del Agua Mansa,’ ‘Mi Hijo el Francés’ and ‘Un Novia del Dia.’ He further wrote two works of fiction, ‘La Perla de la Diaria’ (1866) and ‘Cantos Sociales’ (1868). Much of what he wrote remains in the files of periodicals.

OTFRIED, ŏt'frēd, Alsatian theologian and poet: b. about 800; d. about 875. He was the author of one of the earliest specimens of composition in the German language. After having become a monk of the abbey of Weissenburg, in Alsace, he studied under Rabanus Maurus, abbot of Fulda. He then returned to his monastery, where he opened a school of literature and wrote a variety of works in prose and verse. The most important of these is a rhymed version or paraphrase of the Gospels in Old High German, still extant, in which there are some passages of lyrical poetry. He completed it about 868 and dedicated it to Ludwig, king of Germany. An edition of it was published by Piper in 1898 and modern German translations by Rapp (1858), Kelle (1870); and Pfeifferl, ‘Otfried im Gewande seiner Zeit’ (1905).

OTHELLO, a tragedy by Shakespeare, which, although popularized by the acting of Richard Burbage, the greatest of Elizabethan actors, was not printed until 1622 in what is known as the first quarto. The text of this edition is some 150 lines shorter than that of the first folio (1623), which is the authoritative text. There is little external evidence as to the date of composition, but the internal evidence points to a date between ‘Hamlet’ and ‘King Lear’—probably 1604. There is no better evidence of Shakespeare's power to transform crude material than the contrast between the clumsy story as given in Cinthio's ‘Hecatommithi’ and the play itself. He humanized the characters, gave coherence to a very loose-jointed, rambling story and turned the almost absurd murder of Desdemona into one of the noblest concluding scenes in dramatic literature. The plot has the simplicity and symmetry of a classical drama, violating only the unity of place. The reason for the masterly plot is that it proceeds from the mind of Iago, whose brilliant intellect and masterful will dominate the play. He is, perhaps, the greatest impersonation of evil in Shakespeare's plays, if not in literature. His attempts to find some motives for his deeds were happily characterized by Coleridge as «the motive-hunting of a motiveless malignity.» Complete master of his mind and will, cynical in his views of virtue and love, unscrupulous in his intrigues, he pursues his conquests until at last he is destroyed by a power he cannot understand. In striking contrast is Othello, a primitive, childlike, magnanimous man, who after a life of adventure and romance finds himself in a highly-civilized and somewhat decadent Italian life, whose subtile mind he cannot comprehend. His love for Desdemona, leading to the happy consummation of marriage, is as romantic as any of his hairbreadth escapes and «moving accidents by flood and field.» When at last he is convinced of her infidelity he utters some of the most eloquent and some of the saddest words ever written by Shakespeare. His tragedy is due in part to the passion of jealousy, but it is not an ignoble jealousy, rather the agony of being compelled to hate that which he supremely loves. Desdemona, «the sweetest innocent that e'er did. lift up eye,» suffers passively — like a dumb creature, tortured without cause by the being she adores. Her utter innocence and purity and her timid childlikeness represent the triumph of virtue over evil, but at the same time reveal the mystery of human suffering as goodness suffers vicariously in the struggle with evil. «The tragic loading of the bed» upon which she and the great warrior lie is a suggestion of the mystery which constitutes tragedy in the Shakespearian sense of that word. An interesting contrast is afforded in Browning's 'Luria,' in which the consolation of religion, and especially the hope of immortality, relieve the tragic intensity of the play.

EDWIN MIMS.

OTHMAN, ŏth-män, or **OSMAN I,** surnamed GHAZI, «the Victorious,» Turkish sultan, founder of the Ottoman or Osmanli empire, which was named after him: b. Sukut, Bithynia, 1259; d. 1326. In 1288 he succeeded his father, Ertoghrul, as chief of a Turkish horde in Phrygia, and in 1299, after successful campaigns which put the eastern part of Asia Minor in his hands, proclaimed his independence and took the title of sultan. Nicæa (1304), Marmora (1307) and Broussa (1326) came under his sway, and in his last years he made Karahissar his capital and issued a regular coinage. He was succeeded by his son Orkhan.

OTHMAN, or **OSMAN II,** sultan of the Turks: b. 4 Nov. 1605; d. Constantinople, 20 May 1622. The son of Ahmed I, in 1618 he came to the throne as 16th sultan and successor of his deposed uncle Mustapha I. He was defeated at Choczim (1621) by Sigismund III, king of Poland; attempted to suppress the Janizaries, but was captured by them and imprisoned. He was killed in prison by the grand vizier.

OTHMAN IBN AFFAN, third Moslem caliph: b. Mecca, about 565; d. Medina, 656. Mohammed's secretary and lieutenant, he married successively the prophet's two daughters, and in 644, after the death of Omar, was chosen caliph by the six appointed by Omar, of whom one actually wished Othman's election, each of the others pressing his own claims. Othman was then old and feeble, and not by nature over energetic in his prime, but he seems to have carried things with a high hand. He occupied Persia (645–647), eastern Africa and Nubia (651), began the spread of Islam in the islands of the Mediterranean, dared remove from their offices the tried generals of Abu Bekr and Omar to make room for his kinsmen and favorites, and raised a storm of disapproval by sitting in the very seat of Mohammed instead of two steps below it, like his two predecessors. He attempted to introduce a definitive revision of the Koran. A great plot, embracing all his early rivals and the sectaries who differed with him, was formed; the caliph having broken his promise to appoint new governors, was besieged and was assassinated by Abu Bekr at Medina. His rule, though disturbed at home, was the beginning of the imperial growth of Islam, thanks to the conquest of Cyprus, Armenia, North Africa, etc. Consult Muir, Sir William, 'Annals of the Early Caliphate' (1883).

OTHO I, ō'thō (THE GREAT), founder of the Holy Roman Empire: b. 23 Nov. 912; d. 7 May 973. He was son of Henry I and was elected and crowned king of Germany at Aix-la-Chapelle in 936. His reign of 36 years was an almost uninterrupted succession of wars. After a 14 years' struggle he subdued Boleslav, duke of Bohemia; wrested the duchies of Swabia, Bavaria and Lorraine from the dukes of Bavaria and Franconia and gave them (in 949) to his sons Ludolf and Henry and to his son-in-law Conrad, count of Worms, respectively. He delivered the Italians from the oppressions of Berengar II, married the widow of Lothair, their first king, and was crowned king of Lombardy (951). In 955 he crushed the Hungarians on the Lechfeld. In 961 he was crowned king of Italy and in the next year emperor by Pope John XII. But shortly after John made an alliance with Adalbert, king of Upper Italy, to drive the Germans out. Otho the following summer marched against Rome, drove John out, deposed him and placed Leo VIII in the papal chair, though this proceeding is recognized as uncanonical and Leo is reckoned an anti-pope. The Byzantine court refused to acknowledge Otho's claim to the imperial dignity; but he defeated the Greek forces in Lower Italy, and the eastern emperor, John Zimisces, gave the Greek princess Theophania to Otho's son Otho in marriage. He was at once the greatest political and military power of the West, and he succeeded in putting an end to the divided allegiance of his clergy between throne and church.

OTHO II, called DER ROTE («The Red»), Holy Roman Emperor: b. Rome, 955; d. there, 7 Dec. 983. He was the youngest son of Otho I. His elder brothers had all died before their father, who caused him to be crowned joint emperor (967), the first instance of the kind in German history. He assumed power in 973 and subdued the revolt of several powerful vassals, including his cousin, Henry II, duke of Bavaria. In Italy he suppressed a rising under Crescentius and then attempted to drive the Greeks from Lower Italy; but they called in the aid of the Saracens from Sicily and Otho suffered a total defeat near Cotrone, Calabria, 13 July 982 and with difficulty made his escape on a vessel. He died before fresh plans of conquest against Greeks and Arabians could be executed.

OTHO III, called MIRABILIA MUNDI («Wonder of the World»), Holy Roman Emperor: b. July 980; d. 23 Jan. 1002. He was son of Otho II, and the last of the male branch of the Saxon imperial house. He was only three years old when he succeeded his father. In 996 he marched into Italy and crushed a fresh insurrection fomented by Crescentius. He was crowned emperor in 996 by Gregory V. He again crossed the Alps in 998 to suppress a second rebellion under Crescentius, whom he caused to be beheaded. On the death of Gregory, Otho raised his old tutor, Gerbert, to the pontificate as Slyvester II. Peace in Rome was, however, only temporary, and until his death Otho was mostly employed in quelling disturbances in various parts of Italy. Some historians assert that his death was due to poisoning, an act of revenge on the part of the widow of Crescentius. The emperor was a strict religionist, much given to penances and pilgrimmages.

OTHO IV, Holy Roman Emperor: b. 1182; d. 19 May 1218. He was the son of Henry, Duke of Saxony. He was educated at the court of his uncle, Richard I of England, was chosen by the Guelphs as rival king to Philip of Swabia in 1198, was recognized as sole king in 1208 and was crowned emperor at Rome, 4 Oct. 1209. However, the emphasis which he placed upon imperial sovereignty in Italy displeased the Pope, who excommunicated him in 1210 and in 1212 declared Frederick II the true king of Germany. He finally relinquished the struggle against Frederick and retired to his possessions in Brunswick.

OTHO, or OTTO, I, king of Greece, second son of King Louis of Bavaria: b. Salzburg, 1 June 1815; d. Bamberg, 26 July 1867. He was educated at the University of Munich, was nominated king of Greece by the London Conference 7 May 1832 and chosen to this office by the Greek National Assembly 8 August. Until 1 June 1835 he was guided by a regency. Upon coming to his majority he showed himself too weak, too easily influenced by his Bavarian courtiers, and, above all, too much under Russian control to win the confidence of the people. He was compelled to grant a constitution, the working of which was hampered by factional strife. Internal discord, financial difficulties and open breaks with Great Britain and France followed and 24 Oct. 1862 he was deposed by a provisional government and returned to Bamberg. The only work of any importance that he accomplished for Greece was the organization of a system of education; a stronger man in his place would probably have profited by the repeated opportunities given Greece to acquire some territory of Turkey. He was succeeded by Prince George of Denmark.

OTHO, Marcus Salvius, Roman emperor: b. 32 A.D.; d. 69 A.D. He was for a time governor of the province of Lusitania (Portugal) and joined Galba when the latter rebelled against Nero. On Galba's accession in 67 Otho became the royal favorite and was made consul; but when Galba appointed Piso as his successor, Otho, securing the allegiance of the Pretorian Guard, had Galba and Piso murdered and was proclaimed emperor in 69. The eastern provinces acknowledged him as emperor, but in Germany Vitellius was proclaimed by the legions of the lower Rhine. At first successful, dissensions broke out among his genereals, the forces of Otho were finally overthrown by Vitellius at Berbriacum, in Italy, and the emperor killed himself after reigning three months and a few days. Consult Henderson, B. W., 'Civil War and Revolution in the Roman Empire, 69–70 A.D. (1908).

OTHO OF FREISING, frī'zĭng, German chronicler of the Middle Ages: b. about 1114; d. Morimund, 21 Sept. 1158. He was the third son of the Margrave Leopold IV of Austria and Agnes, daughter of the Emperor Heinrich IV. In his 14th year he was made provost of the Institute of Kloster-Neuburg but studied at Paris. He entered (1130) the Order of Cistercians at Morimund, Burgundy, became (1132) abbot of this monastery and (1137) then Bishop of Freising where he upheld the external conditions of the Church while he instituted successfully internal reforms. He was one of the earliest to introduce the Aristotelian philosophy into Germany. From 1147–49 he accompanied the unfortunate crusade of Conrad III. He brought out his so-called 'Chronicles' (1143–46) in eight books, treating the history from the philosophic side, under the title 'De duabus civitatibus,' with great purity of diction and grip on the material. More valuable as a useful source is his 'Gesta Friderici imperatoris' (continued to 1156) by him, then finished by Ragewin. This work was instigated by the emperor. His works were first published by Euspinian (Strassburg 1515), then by Wilmans in Monumenta Germanide historica, Scriptores,' vol. 20 (special edition Hanover 1867), translated by Kohl (Leipzig 1894). Consult Hashagen, 'Otto von Freising als Geschichtsphilosoph und Kirchenpolitiker' (ib. 1900); Schmidlin, 'Die Geschichtsphilosophie und kirchenpolitische Weltanschauung Ottos von Freising' (Freiburg 1906).

OTHO OF NORDHEIM, nōrt'hīm, Duke of Bavaria: d. 11 Jan. 1083. He was a descendant of the powerful Saxon family of the counts of Nordheim. Agnes, widow of Henry III, gave Otho the duchy of Bavaria in 1061, in order to have his help in the fight which she foresaw would be waged against the claims of her son Henry IV to the empire. Otho, however, took sides with her enemies; Henry was seized in 1062 and Anne was deposed. This treachery of Otho was never forgotten by Henry IV, who in 1070 caused Otho to be accused of a conspiracy against the emperor. Otho in consequence was deprived of his duchy and forced to submit. He made several attempts to regain his territory and power and in 1077 secured the election of Rudolph of Swabia as German king. Otho remained in arms against Henry until his death. Consult Vogeler, Adolf, 'Otto von Nordheim' (Minden 1880).

OTIS, Bass, American artist: b. New England, 1784; d. 1861. He first came into public notice as a portrait painter in New York, and nothing is known about his previous years of study. In 1812 he settled in Philadelphia, where his only known genre picture, 'Interior of a Forge,' hangs in the Pennsylvania Academy of Fine Arts. His portraits include those of President Jefferson; Alexander Lawson; the painter Jarvis, and Dr. Physick, and one of himself. Some of his works he reproduced in mezzotint, and he is said to have produced the first lithograph in America.

OTIS, Elisha Graves, American inventor: b. Halifax, Vt., 3 Aug. 1811; d. Yonkers, N. Y., 8 April 1861. He worked on a farm; was a carriage maker 1838–45, and was head of manufacturing concerns in Albany, Bergen Heights, N. J., and Yonkers. His great invention, that of a safety device for an elevator so that it cannot fall even if the cable on which it is hung should break, was perfected for use in the last-named factory and probably did more to increase the value of city real estate by making tall buildings possible than any other invention of the century. Otis also invented a special and independent engine for elevators, as well as a staple machine, a steam plow, a rotary oven and a safety bridge, which although without a draw does not impede navigation. The great elevator business begun by him was continued by his sons, Charles Rollin and Norton Prentiss Otis.

OTIS, Elwell Stephen, American soldier: b. Frederick, Md., 25 March 1838; d. 21 Oct. 1909. He was graduated at Rochester University in 1858 and at Harvard Law School in 1861; entered the Union army in 1862 as captain of the 140th New York Infantry and took part in many battles. Disabled for duty by a wound at Petersburg, 1 Oct. 1864, he was discharged from the volunteer service with brevet rank of brigadier in 1865; in 1866 became lieutenant-colonel of the 22d Infantry; served in the West 1867–85; in the campaign of 1876–77 reducing Sitting Bull to submission, and was organizer and head of the Leavenworth School of Infantry and Cavalry from 1881 to 1885. He commanded at Assiniboine, Mont., 1885–90: from 1890 to 1893 was superintendent of the recruiting service, his rank in the latter year being full brigadier; and, after commanding the departments of the Columbia (1894–97) and of the Colorado (1894–98) and the department of the Pacific (1898–99), was appointed commander of the United States forces in the Philippines and military governor. He was a member of the Philippine Commission 1899. In May 1900 he retired from the governorship of the Philippines; in June was promoted major-general, and in October became commander of the department of the Lakes, a post which he held until his retirement from active service in March 1902.

OTIS, Fessenden Nott, American surgeon: b. Ballston Spa, N. Y., 6 March 1825; d. New Orleans, 24 May 1900. He was graduated from the New York Medical College in 1852; was surgeon of the New York police department in 1861; lecturer on genito-urinary diseases at the New York College of Physicians and Surgeons 1862–71 and clinical professor there from 1871 to 1890. Among surgical instruments invented by him may be cited the urethrometer and the dilating catheter. He was the author, among other works, of 'Urethral Strictures' (1877); 'Genito-Urinary Diseases' (1883).

OTIS, George Alexander, American surgeon: b. Boston, 12 Nov. 1830; d. Washington, D. C., 23 Feb. 1881. He was graduated (1849) at Princeton and (1851) at the medical department of University of Pennsylvania, continuing his studies in London and Paris. He settled (1852) at Richmond, Va., but moved (1854) to Springfield, Mass. At the outbreak of the Civil War he was appointed surgeon of the 27th Massachusetts Volunteers and was mustered in in 1861. Serving throughout the war he received four brevets for distinguished service. In 1864 he was made curator of the Army Medical Museum and placed in charge of the division of surgical records. Among other works he wrote 'Surgical History of the War of the Rebellion' (unfinished). For some years he edited the *Virginia Medical and Surgical Record* and remained a regular contributor thereafter. In 1880 he was promoted to the rank of major and surgeon in the regular army.

OTIS, Harrison Gray, American orator and statesman, nephew of James Otis (q.v.): b. Boston, Mass., 8 Oct. 1765; d. there, 28 Oct. 1848. He was graduated from Harvard in 1783, studied law and was admitted to the bar in 1786. He was a member of the Federalist party in Congress, 1797–1801, and United States senator, 1817–22. He had previously sat in the Massachusetts legislature, and he took an active part in the Hartford Convention of 1814, and was mayor of Boston in 1829. In the Senate he opposed the extension of slave-holding territory. His published works include 'Letters in Defense of the Hartford Convention' (Boston 1824) and 'Orations and Addresses.' Consult Loring, J. S., 'The Hundred Boston Orators' (Boston 1854).

OTIS, Harrison Gray, American soldier and journalist: b. near Marietta, Ohio, 10 Feb. 1837; d. 30 July 1917. He was apprenticed to a printer at 14 and had a few months' education at Lowell, Ohio (1856–57), but was graduated (1857), after a commercial course, at Granger's College, Columbus. In 1860, while residing at Louisville, Ky., he was sent as delegate to the Chicago Republican National Convention that nominated Lincoln for President. Serving throughout the Civil War he rose to lieutenant-colonel of volunteers by brevet, and was present in the western Virginia field (1861), and from Bull Run bridge to Antietam (1862). After his discharge he published a small paper at Marietta, became official reporter of the House at the 1866–67 session of the Ohio legislature, then served (1867–70) in the government printing office at Washington. In 1876 he moved to Santa Barbara, Cal., where he conducted the *Press*, and in 1882 he became identified with the Los Angeles *Daily Times*, acquiring control by 1886. Offering his services on the outbreak of the war with Spain he was commissioned brigadier-general of volunteers (1898) and served in the Philippines and later during the Filipino insurrection. His brigade captured (1899) Caloocan. In his conduct of the Los Angeles *Times* he relentlessly opposed union labor, for which action the *Times* building was dynamited (1910) and 21 employees killed. In 1911 the McNamara brothers confessed their participation in the crime, thereby placing the act clearly on the shoulders of the labor union and creating a prolonged legal prosecution of the greatest public interest.

OTIS, James, American Revolutionary statesman: b. West Barnstable, Mass., 5 Feb. 1725; d. Andover, Mass., 23 May 1783. He was graduated from Harvard in 1743, studied law in the office of Jeremiah Gridley at Boston, was admitted to the bar at Plymouth, but after two years of practice there settled in 1748 in Boston, where he quickly attained eminence in the courts. During his rise in the law, he found an avocation in the study of the classical and English literatures, and published 'The Rudiments of Latin Prosody' (1760), a work of careful scholarship. He was appointed attorney-general, but this post he resigned rather than support the writs of assistance, application for which had been made in the Massachusetts Supreme Court. These writs were warrants permitting general search for smuggled goods, and Otis was entirely convinced of their illegality. In February 1761 the matter came to debate before the court. Gridley appeared for the crown and Otis and Oxenbridge Thacher, another well-known lawyer, for the opposition. Otis' speech, occupying some four or five hours and marked by an argument of great learning and intellectual force, has been called the prologue of the Revolution. John Adams, whose notes taken in the court-room and later revised are the only authority for the content of this great effort, declares that «then and there was the first scene of the first act of opposition to the arbitrary claims of Great Britain.» Decision was reserved; and though some writs were granted, none was ever enforced. In 1761 Otis was elected to the legislature, where he gained a high reputation for his eloquence and patriotic earnestness. From this time until 1769 he was the pre-eminent leader of thought in that discussion and development of opinion which preceded the war. In 1762 he published 'A Vindication of the Conduct of the House of Representatives of the Province of Massachusetts Bay.' a brochure of «exasperating candor,» of which John Adams said: «How many volumes are concentrated in this little fugitive pamphlet . . . !» This is regarded as a chief source for subsequent arguments against Parliamentary taxation and in favor of free speech. It was followed by two others, 'The Rights of the British Colonies Asserted and Proved' (1764), which maintained a conciliatory tone and was therefore displeasing to the extremists, and 'Considerations on Behalf of the Colonies' (1765), increasingly bitter, and satisfactory to his previous critics. Otis was a prominent member of the Stamp Act congress, which met at New York in October 1765; in 1766 was elected speaker of the general court, but did not assume office because of the negative of the governor. In 1768, after Townshend's bill for the taxation of the colonies had been passed by Parliament, the general court despatched to the remaining colonies a second circular-letter, urging unity in some plan toward common protection. This letter was drafted by Otis and corrected by Samuel Adams. Bernard, royal governor, demanded the recall of the letter as traitorous, and Otis made a speech, advocating non-compliance, which the Royalists thought might be the «most violent, insolent, abusive and treasonable declaration» ever uttered. But the legislature did not vote for the recall of the circular. Otis was now wholly occupied with public interests, writing for the press and addressing political gatherings. In 1769 he was accused in England of treason by the customs commissioners, and replied by a denunciation of the commissioners in the Boston *Gazette*. He thus became involved in a quarrel with Robinson, one of the commissioners, during which he received a wound of the head which is supposed to have brought about his subsequent insanity. He was awarded £2,000 damages, but refused to claim the sum upon receipt of a written apology. During the rest of his life he was subject to fits of aberration, and though he was in the legislature in 1771 and for a brief time resumed his Boston practice, he continued in general unequal to public and professional duties. While in an unbalanced condition he took part in the battle of Bunker Hill. He was killed by a flash of lightning. More than any other American Otis gave the impetus and direction to the struggle for independence. Consult the biographies by Knapp in 'Sketches of Eminent Lawyers, Statesmen and Men of Letters' (1821) and Tudor (Boston 1823); also Tyler, M. C., 'Literary History of the American Revolution' (New York 1897); and the 'Life' by F. Bowen (Boston 1847).

OTITIS, or **OTITIS MEDIA,** inflammation of the tympanic cavity of the ear. It may be either acute or chronic; and may come on during the course of certain febrile affections, especially scarlatina, or in consequence of a scrofulous, rheumatic or gouty constitution; or it may be excited by direct causes, as exposure to currents of cold air, violent syringing or probing, etc. The acute form is usually ushered in with sudden pains, coughing and buzzing noises, and by increased deafness. Unless prompt relief measures are taken, suppuration follows, and the membrane of the tympanum becomes ulcerated and pus discharges follow, or inflammation of the dura mater and abscesses in the brain may be established. In less severe cases there is usually considerable persistent damage, and an obstinate discharge of matter is a frequent sequence of the disease. The treatment of so serious an affection must be left solely in the hands of the medical practitioner. The symptoms of the chronic and less acute varieties of otitis are unfortunately so slight, that they are often neglected, until the patient finds the sense of hearing in one or both ears almost completely gone. In these milder forms, the general treatment is to combat the diathesis on which they frequently depend, and to improve the general health. Small blisters occasionally applied to the nape of the neck or to the mastoid process are often of service in very chronic cases. If there is any discharge, the ear should be gently syringed once or twice a day with warm water, after which a tepid solution of sulphate of zinc (one grain to an ounce of water) may be dropped into the meatus and allowed to remain there two or three minutes.

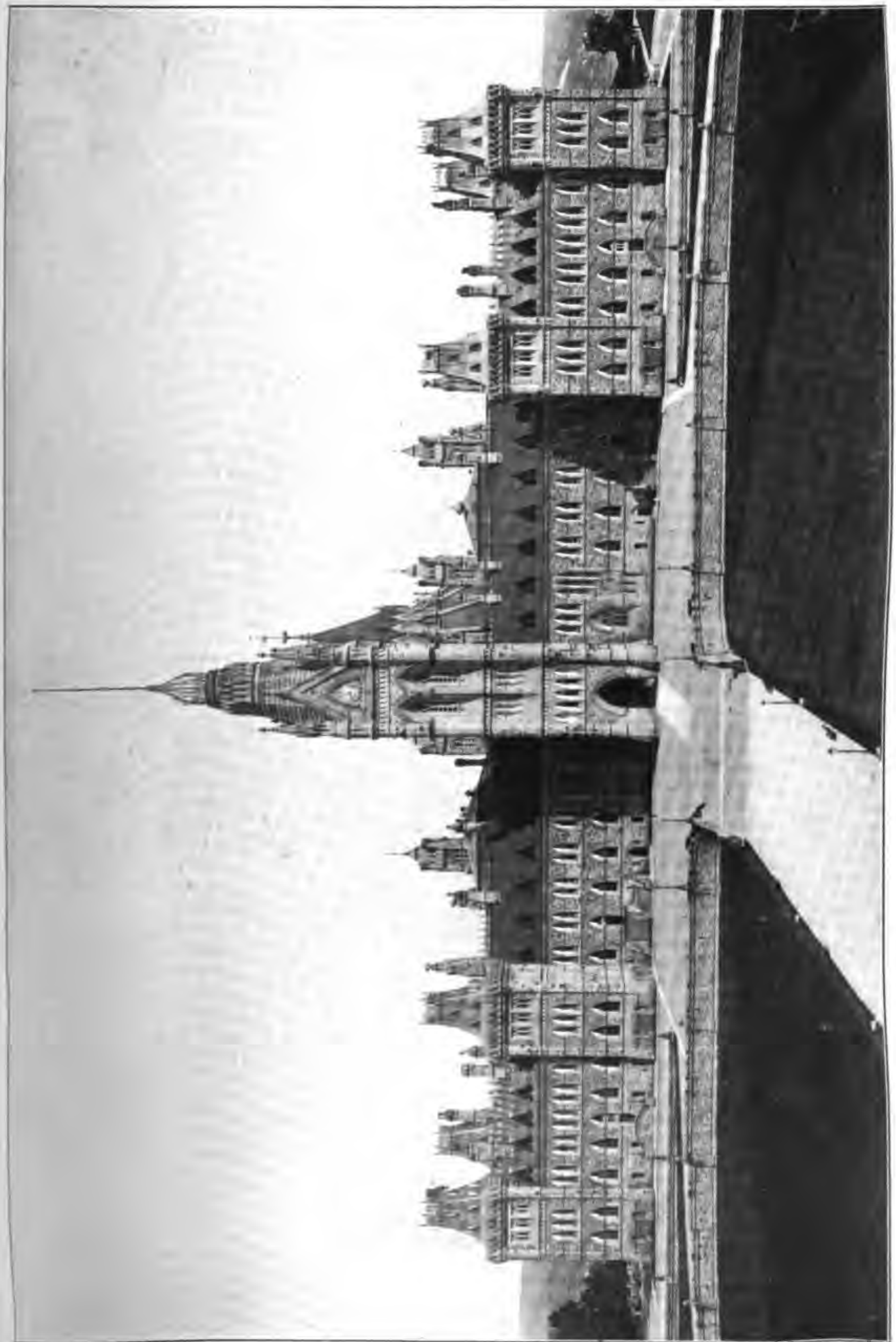
OTO, ō'tō, an Indian tribe of North America of Siouan stock. They dwelt formerly in eastern Nebraska, south of the Platte River. The remnants of the tribe, numbering about 400, now share a reservation in Oklahoma with the Missouri, with whom they have a common language.

OTOCYON. See CAPE FOX.

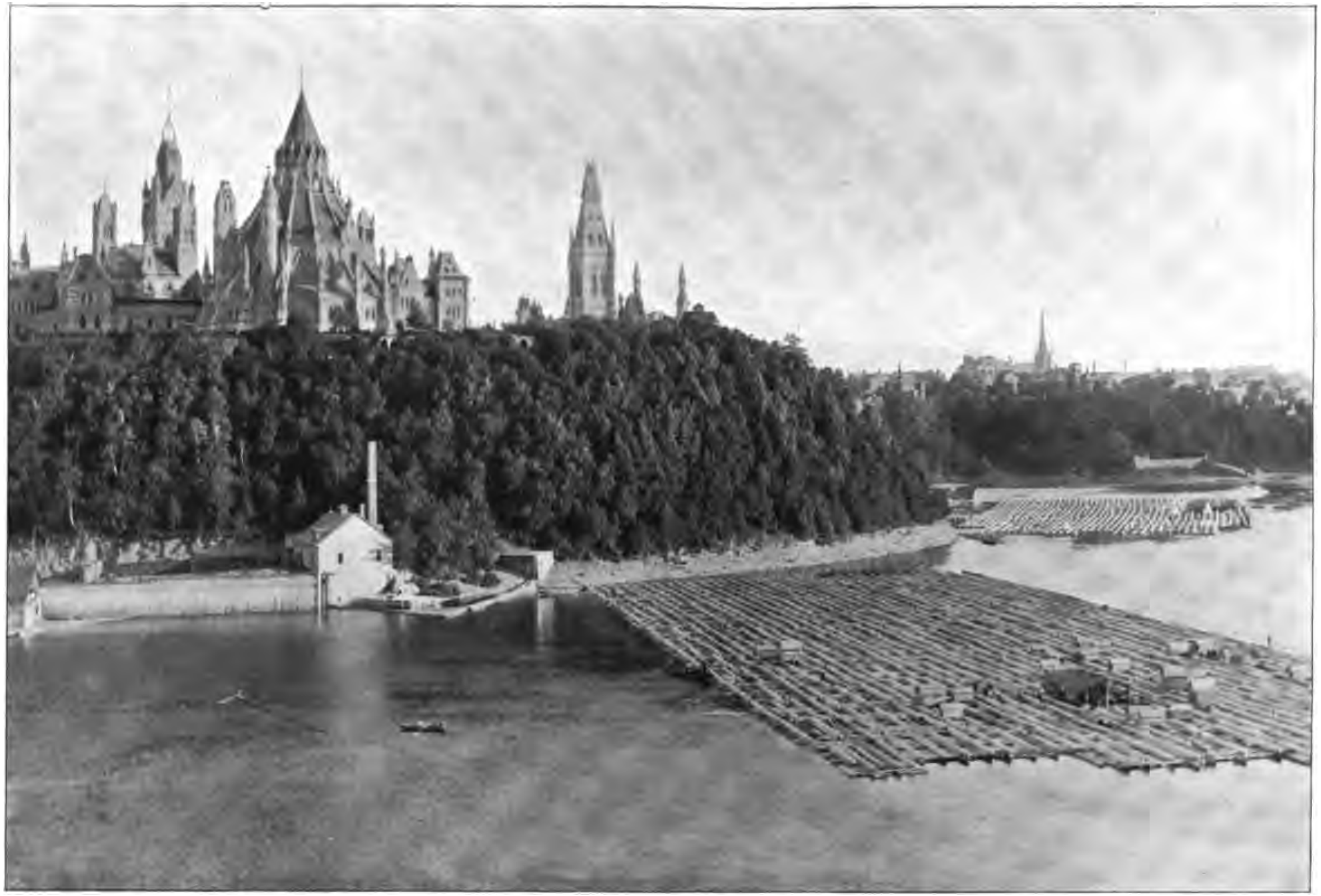
OTOLITH. See ANATOMY; EAR.

OTOMACO, ŏ'tō-mä'kō, a South American Indian tribe, dwelling in the Orinoco forests of central Venezuela. They are very savage and represent a very low state of Indian culture. No adequate study of them has yet been made, but it is supposed that they constitute a separate linguistic stock. Consult Chamberlain, A. F. (in *Journal de la Société des Américanistes de Paris,* New Series, Vol. VII, Paris 1910); and Tavera-Acosta, 'En el Sur' (Ciudad Bolivar 1907).

OTOMI, ō-tō'mē, or **OTHOMIS** (Nahuatl *otomitl,* wanderer), one of the most ancient and most widely scattered Indian tribes in Mexico. Previous to the appearance of the



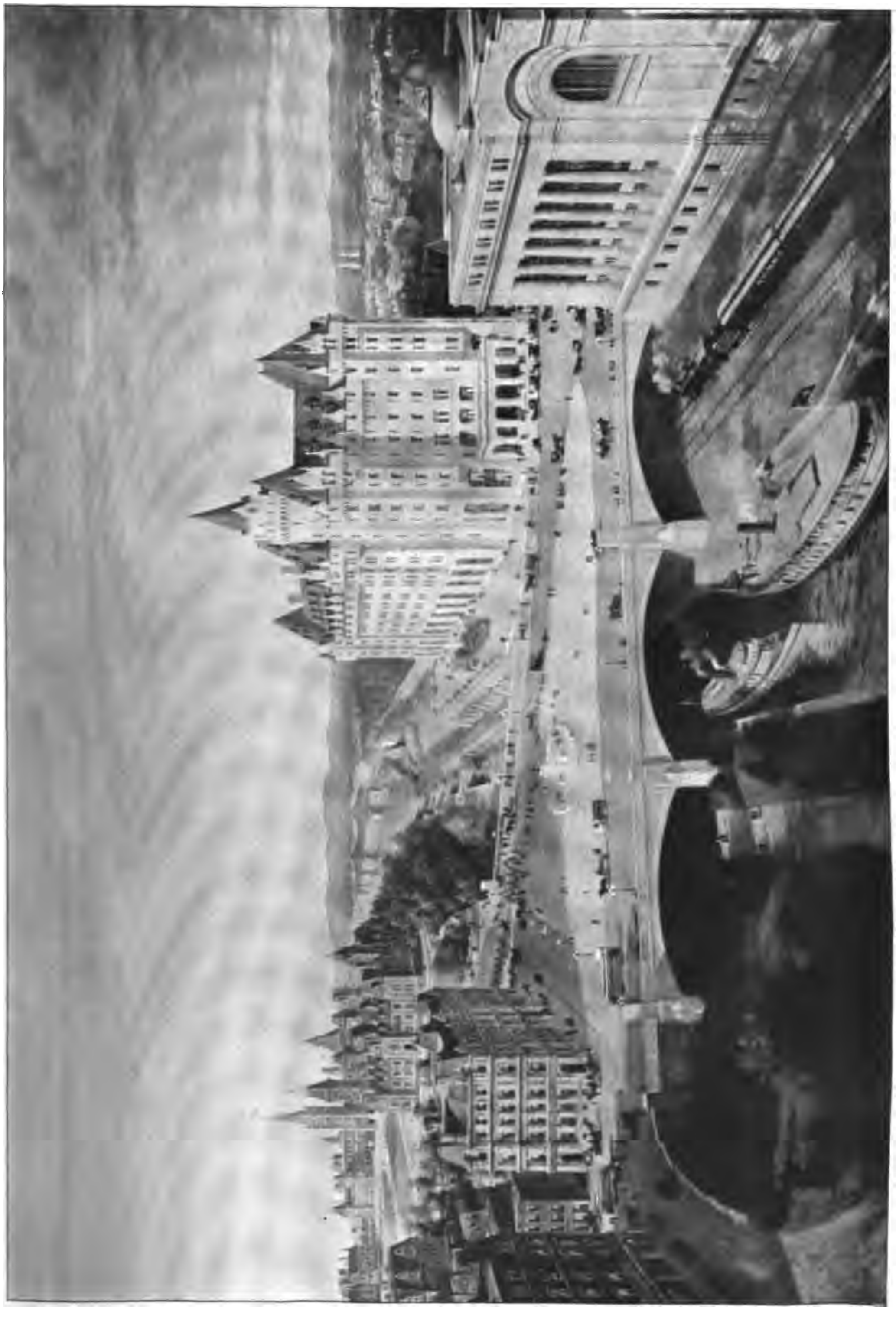
Parliament Buildings — Front



Topley, Photo

RAFT OF TIMBER ON THE OTTAWA RIVER AT OTTAWA, SHOWING THE LIBRARY OF PARLIAMENT AND THE PARLIAMENT BUILDINGS

OTTAWA, CANADA



Showing the Central Section, Chateau Laurier, locks of the Rideau Canal, the old Parliament Building, the Ottawa River and the Laurentians in the distance

Toltecs, by whom they were driven to the mountainous regions of the country, they were settled in the valley of Mexico. On the decline of the Toltec power they returned, but were afterward dislodged by the Aztecs. At a later period part of their territory was regained. They became partially civilized before the appearance of the Spaniards by whom they were conquered. Some of the bands accepted Christianity. They occupy the mountainous portions of the states of Querétaro, Hidalgo and Guanajuato, and numerous bands are found in several other portions of the country. Their language is one of the most unpleasant of all Indian dialects, but many of the people converse in Spanish, and have become Mexican citizens. A grammar and dictionary was published in 1767, and several small religious works in the native tongue have been issued.

OTRANTO, Strait of, passage between the Adriatic and Ionian seas, separating the southernmost part of Italy from Albania. Its minimum width is 45 miles between Cape Glossa, Albania, and Otranto, Italy.

OTSEGO, ŏt-sē'gō, a lake in Otsego County, N. Y., the main source of the Susquehanna River. It is a beautiful body of water; along its shores are many attractive cottages, but it is noted chiefly for its connection with James Fenimore Cooper (q.v.). Cooperstown (q.v.) is on the south shore.

OTSEGO BASS. See WHITEFISHES.

OTTAR OF ROSES. See ATTAR OF ROSES.

OTTAWA, ŏt'ạ-wạ, Canada, city, capital of the Dominion of Canada and of Carleton County, in the province of Ontario, at the confluence of the Ottawa and Rideau rivers, and on the Canadian Pacific, Canada Atlantic (Grand Trunk), Canadian Northern, and New York and Ottawa (New York Central) railroads, about 120 miles west of Montreal. The Chaudiere Falls, in the Ottawa River, are 600 feet wide and 40 feet high. A road bridge spans the river immediately below the falls, while the Canadian Pacific Railroad bridge crosses some distance above, and a large combined railway and road bridge an equal distance below. The Rideau Falls, so called by the early French explorers because of its curtain-like appearance, carry the waters of the Rideau River into the Ottawa, toward the eastern end of the city. These falls, as well as the Chaudiere, supply extensive water power. A careful estimate places the available water power in the immediate neighborhood of Ottawa at 200,000 horse power, while within a radius of 45 miles there is a total of 1,000,000 horse power. Ten bridges cross the Rideau River within the city limits. A beautiful driveway has been designed which is to engirdle the city, 30 miles of which have been constructed. The Ottawa River and its tributary, the Gatineau, are the routes by which timber is brought down to Ottawa from the great northern limits.

Industries, etc.—Around the Chaudiere are a number of large industries, for the most part connected with the cutting and manufacture of lumber. The cut of timber in the Ottawa Valley has been nearly 700,000,000 cubic feet in one year, and almost every foot was prepared for market in the Ottawa and Hull lumber mills. Besides the lumber industry proper, there are large mills and factories, both on the Ottawa side and in the neighboring city of Hull, for the manufacture of matches, indurated fibre ware, wooden ware, pulp and paper, as well as flour mills, tanneries, brick and tile works, foundries, machine-shops, railroad car and repair shops, furniture factories, carriage works. There are some 180 factories, employing 17,000 hands. Ottawa is the centre of a good farming district, and within a few miles of the city, on the Quebec side of the river, are extensive mineral deposits, iron, asbestos, phosphate of lime, mica, zinc, plumbago. Electric railways cover every section of the city, and extend out of town east to Rockliffe Park, and west to Britannia-on-the-Bay, on the south side of the Ottawa, and Victoria Park, on the north or Quebec side.

Principal Buildings.— The Parliament and government buildings, situated on Parliament Hill, 125 feet above the river, and covering about four acres of land, are built in the Italian Gothic style, of Canadian sandstone quarried in the Ottawa Valley, and Devonian sandstone from Potsdam, N. Y. The foundation-stone was laid by the Prince of Wales (later King Edward VII) in 1860. The original buildings, including the Victoria Tower, 180 feet high, and the library, cost about $8,000,000. The Parliament building was (with the exception of the library) destroyed by fire 3 Feb. 1916, and is now (1918) in course of reconstruction. The growth of the country in recent years has necessitated the building of a fourth large building, known as the Langevin Block, facing the Houses of Parliament, but outside the grounds, and since its completion, government business has increased so rapidly that many large buildings have had to be leased for departmental use, in various parts of the city. Other prominent buildings are Rideau Hall, the official residence of the governor-general, the post office, city hall, public library, banks, churches, colleges and schools. Important buildings erected within recent years include the Victoria Museum, which accommodates the Geological Museum and the National Art Gallery, and is the temporary meeting place of the Dominion Parliament; the Royal Mint, the Astronomical Observatory; the National Archives; the building devoted to the customs and state departments; and the Chateau Laurier, a magnificent hotel operated by the Grand Trunk Railway.

Churches, Educational Institutions, Libraries, etc.— There are two cathedrals, Church of England and Roman Catholic, as well as six hospitals, orphanages and homes for the aged and the friendless. Under the school laws of the province separate systems of schools are maintained for Protestants and Roman Catholics. The chief educational institutions are the University of Ottawa (Roman Catholic), the Provincial Normal School, affiliated with Toronto University, the Model School, Collegiate Institute, Ladies' College, Saint Joseph's College, and a number of special schools in charge of the Oblate Fathers, three theological schools, a number of private academies, and the public and separate schools. There are several libraries, chief of which is the Library of Parliament, which contains over 200,000 volumes, besides some valuable manuscripts. Next to Toronto, Ottawa is the chief intellectual centre of the Dominion and is the headquarters of the Royal Society of Canada. Representatives from a number of foreign countries, including a United States consul-general, are stationed at Ottawa. The Pope is represented here by a special envoy. The head office of the Bank of Ottawa is here.

History, Government, etc.— Champlain gives us the first account of what is now the site of Ottawa, but it was not until the end of the 18th century that the first white settler, one Philemon Wright, a New Englander, cut a home for himself out of the woods on the Hull side of the river. Wright acquired property on the south side as well and transferred the site of the future capital to one Nicholas Sparks as payment for farm labor. Sparks reluctantly accepted the land. His descendants are now among the best-known and wealthiest families of Ottawa. In 1826 the British Government sent out Colonel By to survey and construct the Rideau Canal, to connect the Ottawa with the Saint Lawrence at Kingston. The engineers and laborers engaged upon the canal formed the nucleus of the future city, which was at first called Bytown. Sir John Franklin, returning home from one of his Arctic voyages, laid the corner-stone of the canal locks in 1827. In 1854 Bytown was incorporated as a city and the name changed to Ottawa. In 1858 Queen Victoria selected it as the capital of Canada, much to the disgust of the rival cities of Montreal, Quebec and Toronto. The first Dominion Parliament was held here in 1868. The government maintains a large experimental farm a mile or two southwest of the city. Hull (q.v.), across the river and in the province of Quebec, is one with Ottawa in commercial and industrial matters, but entirely separate in municipal government. The government of both cities is vested in a mayor and corporation. Pop. (1900) 58,193; (1910) 87,062; (1916, local estimate) 105,000.

Lawrence J. Burpee.

OTTAWA, Ill., city, county-seat of La Salle County, at the confluence of the Fox and Illinois rivers, on the Illinois and Michigan Canal, and the Chicago, Burlington and Quincy and the Chicago, Rock Island and Pacific railroads, about 80 miles southwest of Chicago. It was settled as farm land in the early part of the 19th century, but was not incorporated until 1837. It is in a productive agricultural region, in which are extensive deposits of fire-clay, glass-sand and bituminous coal. It has considerable manufacturing interests. The chief establishments are glass factories, potteries, agricultural implement shops, saddleries, carriage factories and organ and piano factories. It has a large trade in brick, tile, sewer pipe and other manufactures, and in farm and dairy products. Some of the prominent buildings are the Illinois Appellate Court building, the city and county buildings, the Ryburn Memorial Hospital and the church and school buildings. Its educational institutions are Pleasant View College, under the auspices of the Lutherans, Saint Francis Xavier Academy (Roman Catholic), public and parish schools, a high school library, and Reddick's public libraries. It has four beautiful parks. The city charter, in accordance with the State law of 1871, provided for a mayor, who holds office two years, and a council; but now the government of the city is on the commission plan. The city owns and operates the waterworks. Pop. 14,000.

OTTAWA, Kan., city, county-seat of Franklin County, on Marais des Cygnes River, and on the Missouri Pacific, the Atchison, Topeka and Santa Fé, and the Southern Kansas railroads; about 40 miles southeast of Topeka. It is in a farming and dairy section. The place was named for the Ottawa Indians who emigrated from Ohio in 1833. The town was founded by John Tecumseh Jones, a Pottawatomie missionary, who taught the Ottawas. The Santa Fé Railroad shops, employing 400 men, are located here. It has flour mills, carriage works, creameries, grain elevators, brick and tile yards and a furniture factory. There is considerable trade in livestock, dairy products, nursery stock, grain, wool and fruit. It is an attractive, residential city, with well-kept streets and fine parks. It is noted for its moral tone and as being an educational centre. It is the seat of Ottawa University, a Baptist institution which had, in 1917, 388 students. It has the summer educational and social gathering called the Ottawa Chautauqua Assembly, the second (in point of time) «Chautauqua» in the United States. It has also a free public library. There are very many church edifices, and the place is often called «The City of Churches.» The water system and electric-lighting plant are municipally owned. In 1913 the commission form of government was instituted. At least 90 per cent of the population are native-born white Americans. Pop. 7,650.

OTTAWA, Ohio, village, county-seat of Putnam County, on the Blanchard River, and on the Findlay, Fort Wayne and Western, the Cincinnati, Hamilton and Dayton, and the Detroit, Toledo and Ironton railroads, and the Ohio Electric road. It is about 90 miles northwest of Columbus. It is in a farming section, and has several industries connected with farm products and stock-raising. Its chief manufactures are flour, lumber and lumber products, clay products, beet sugar and dairy products. Pop. 3,000.

OTTAWA, a river of Canada, the chief affluent of the Saint Lawrence, forming for the main part of its course the boundary between the provinces of Quebec and Ontario. It rises on the high land which divides the basin of Hudson Bay from that of the Saint Lawrence, in lat. 48° 30′ N., and for 300 miles, from its source to Lake Temiscamingue, runs from northeast to southwest. In portions of its course the river is very irregular in width, being lost in lakes through which it flows, while in others the waters contract to 40 or 50 yards and in many places forming beautiful cascades, fall over precipitous rocky ledges. Lake Temiscamingue is 67 miles long, and varies from a few hundred yards to nearly 10 miles wide. On leaving Lake Temiscamingue, the river, suddenly changing its direction, flows to the southeast for 400 miles, widening at its outlet into the expanse of water known as the Lake of Two Mountains and finally discharges into the Saint Lawrence at the Saint Ann's Rapids, above the island of Montreal. Calumet and Allumette islands, 75 and 95 miles respectively

VNIVERSITY OF OTTAWA
CANADA

above the city of Ottawa, belong to Quebec. Six miles above the city of Ottawa the rapids begin, which terminate in the Chaudière Falls, 40 feet high. The Ottawa is navigable from its junction with the Saint Lawrence to the falls, and is connected with Lake Ontario at Kingston by the Rideau Canal. The river is of considerable commercial importance, from the immense quantity of fine timber cut on its banks, and on those of its tributaries, the chief of which are the Gatineau, Madawasca, Coulogne and Lièvre. The Gatineau is 240 miles long, and the other tributaries mentioned vary in length from 130 to 205 miles. The drainage basin of the Ottawa and its tributaries is estimated at 86,000 square miles. The river was first explored by Samuel Champlain in 1613. Up to the early years of the 19th century it was the thoroughfare of explorers and fur traders from Montreal to the far West. The projected Georgian Bay Canal (440 miles long), which would halve the distance between Montreal and Sault Saint Marie, as compared with the Welland Canal route, would follow the Ottawa River the greater part of the way.

OTTAWA, University of, conducted by the Oblate Fathers of Mary Immaculate, was established in 1848 by the Rt. Rev. J. E. Guigues, O.M.I., D.D., at Ottawa, Canada. Under the presidency of the Very Rev. Father Tabaret, O.M.I., DD., the institution attained a high degree of prosperity. Originally incorporated under the title of «College of Bytown,» this institution received, in 1866, the title of «College of Ottawa,» together with the power of conferring university degrees. In 1883 its charter was so amended as to extend its original powers. The university received at the same time extensive powers of affiliation, in virtue of which, all the degrees conferred by the faculty are officially recognized in the Dominion and in all other British possessions. By a brief, dated 5 Feb. 1889, the Sovereign Pontiff, Leo XIII, raised the University of Ottawa to the rank of a Catholic university, with all the privileges conferred on such universities.

The program of studies includes (1) The theological course, which extends over four years. (2) The philosophical course which is both the crowning of the collegiate course and basis of all professional studies. Students may take their degrees both in sacred theology and philosophy. (3) The course of arts, which extends over four years, at the end of which the student may receive the diploma of bachelor of arts or bachelor of literature, after having passed the prescribed examinations. (4) The collegiate course, extending over three years and embracing all the matters necessary for matriculation. (5) The commerical course. The number of students attending all departments in 1916–17 was 700. These are recruited all over the Dominion, but largely from Ottawa and the surrounding district.

OTTAWA INDIANS, or **OTTAWAS** (from *adawe,* to trade, to buy and sell), an important American tribe of the Algonquian family formerly residing in the region of the Ottawa River in Canada, and when first met with by early French explorers, inhabiting the Manitoulin Islands and the northwest shore of the Michigan Peninsula. They comprised the Kiskakons, the Sinagos and the Keinouches. They believed in a Great Creator whose eye was the sun by day, and the moon and stars by night, and who therefore could see all things everywhere, night and day, and from whom it would be impossible to hide any actions, either good or bad. They were governed by 21 precepts, or moral commandments, which bear a striking resemblance to the Decalogue. They also believed in certain deities who were governed by the Great Spirit over all, and who presided over various places as a country, mountain, river, lake or island; they were careful not to express anything which might displease such deities. Michabon, the «great hare,» presided over the earth and created men from animals. Mirabichi was the «god of the waters.» The Ottawas became the allies and friends of the French, and also of the Hurons, by which latter friendship they incurred the hatred of the Iroquois, and from whom, after the overthrow of the Hurons, they fled to the islands at the mouth of Green Bay, and thence to the country of the Sioux beyond the Mississippi. Becoming embroiled with the Sioux they were driven back, a band settling at Mackinaw, and afterward at Arbre Croche, and another band near Detroit. The Ottawas aided the French in their last war for Canada, but Pontiac (q.v.), chief of the Detroit Ottawas, would not surrender and organized a deep-laid conspiracy for the massacre of the English, in which, however, the Arbre Croche Ottawas would not join. About this time the tribe consisted of about 1,500 persons. During the Revolution and in the War of 1812 they were under British influence. They joined in treaties made in 1785 and 1789, but took arms with the Miamis soon after, again making peace in 1795, and a band about this time making a settlement on the Miami River. Numerous treaties ceding territory around Lake Michigan to the United States followed. A part went south of the Missouri in 1833, where they lost their identity. A band of Ottawas in Ohio, on 31 Aug. 1836, ceded 49,000 acres of land at Maumee, and 200 removed to 34,000 acres on the Osage, south of the Shawnees. Those remaining became scattered. The emigrants prospered for a while, but ill-advised building projects occasioned financial troubles, and, having asked for and obtained a reservation, by common consent they removed to Indian Territory in 1870. In 1836 the Michigan Ottawas ceded all their lands except reservations, and an option was granted them of taking up lands in severalty on these reservations by the treaty of 1855. They are mainly located in Michigan and there are a few in Oklahoma. In 1836 the Ottawas and Chippewas surrendered Manitoulin Island and the 23,000 islands in Georgian Bay to the British Crown. There are under 4,000 Ottawas in the United States and about 750 in Canada. Consult Blackbird, 'History of the Ottawa and Chippewa Indians of Michigan' (1887); and Hodge, 'Handbook of the Indians of Canada' (1913).

OTTAWA UNIVERSITY, founded in 1865 at Ottawa, Kan. It was incorporated under the joint control of the Baptists and the Ottawa Indians; the legislature set apart 20,000 acres from the Indians' reservation for the university, with the provision that two of the six trustees should be Indians. This arrangement did not prove entirely satisfactory, and in 1873 an adjustment was made that placed the university entirely under the control of the Baptist denomination. There is a preparatory department, and in addition to the regular college instruction, there are courses in pedagogy and business. The college work is arranged in two courses, classical and scientific, leading to the two degrees of A.B and B.S. All courses are open to women. The library in 1916 contained 10,000 volumes; the productive funds amounted to $253,000, and the annual income was $43,000. The students (1916) numbered 400, and the faculty 19.

OTTENDORFER, ŏt'ĕn-dôr-fĕr, **Oswald,** German-American journalist: b. Zwittau, Moravia, 26 Feb. 1826; d. 16 Dec. 1900. After studying law at Prague and Vienna he came to this country after the revolutionary disturbances of 1848, and, settling in New York in 1850, soon became editor of the *New Yorker Staats-Zeitung* and later (having married the lady who owned the property) its proprietor. Under his management it became the most influential German daily in America and after 1861 was independent in politics. He built and endowed an educational institution in his native town, founded a home for aged and poor men on Long Island and established the Ottendorfer Free Library in New York.

OTTER, Sir **William Dillon,** Canadian soldier: b. near Clinton, Ontario, 3 Dec. 1843. He received his education at Upper Canada College, Toronto; served for 22 years in the Queen's Own Rifles, active militia of Canada, and since 1883 permanent militia. He saw active service during the Fenian Raids of 1866 and 1870. In the North-West Rebellion of 1885, Otter was in command of the Battleford column; in the Boer War he commanded the first contingent from Canada. In 1905 he was made brigadier-general and major-general five years later. In 1910 he became inspector-general and chief military adviser to the Minister of Militia. He was knighted in 1913 and during the War of 1914–18 served as director of internment operations.

OTTER, a carnivorous mammal of the sub-family *Lutrinæ* of the weasel family (*Mustelidæ*). There are two genera, *Lutra,* including the true otters, and *Enhydris,* including the sea-otter (q.v.). The otters differ from the weasels chiefly in their webbed feet and aquatic life. The body is elongated and averages, exclusive of the tail, about two and one-half feet in length; the tail being somewhat tapering, but flattened, and serving as an efficient rudder to guide the swimming movements of the animal. The legs are short, but muscular, and exceedingly mobile; each foot possessing five webbed toes. The lips are whiskered; the ears short and the eyes large and prominent. The under fur is short, closely set, and woolly, and the outer coat of longer and coarser hairs, of dark-brown hue. In habits the otters are chiefly nocturnal animals, swimming about at night to prey on fishes, of which they are great destroyers, leaving many mangled after merely eating part of the flesh. They wander about a great deal in winter, going across the fields from stream to stream. The burrow is constructed near the waters' edge, the nest being situated at some depth in the bank of the river and lined with grass and leaves.

The American otter (*Lutra canadensis*) averages about four feet in length, inclusive of the tail. The fur is of a lustrous brown color. It inhabits America generally, but is most plentiful in Canada, being rare on the Atlantic border of the United States. The Mackenzie River and other streams running into the Arctic Sea form noted haunts of the Canadian otter. It is chiefly noted for its fur, which is much valued commercially. A peculiar winter habit of this otter consists in numbers of these animals selecting a sloping bank of a river or a ridge of snow, and sliding down the sloping surface upon their bellies, the fore-legs being bent backward, while by means of the hind legs a swift forward impulse is given to the body. This sport (for such it really is) may be continued for a considerable time, the whole process reminding one of schoolboys similarly amusing themselves. These animals are caught in steel traps, which are set generally near the entrance to the burrow, and they have been exterminated in almost all the easily accessible streams of the country.

The European otter (*L. vulgaris*) inhabits Europe generally, and is a well-known denizen of Scotch rivers and streams. To the salmon it is particularly destructive, a pair of otters destroying an immense number of fish, and, as already remarked, leaving large numbers in a mangled condition after each meal. The pursuit of fishes is carried on with great dexterity by the otters, the lithe body accommodating itself quickly to all the turns and gyrations of the finny prey. This otter, although usually of an untamable and somewhat ferocious disposition, can occasionally be domesticated to a very perfect extent. A species (*L. nair*) is said to be tamed in India by fishermen and used for hunting fish; and in Great Britain tame otters have occasionally been kept for a similar purpose. The otter is still hunted for sport by means of dogs (see Otter-hound) bred and trained to their work. When brought to bay the otter will defend itself with great pertinacity and will successfully meet any single dog of ordinary strength. When forced to the water the otter swims deftly and remains for very long periods concealed and swimming beneath the surface. On *Maigre* days the Roman Catholic Church permits the flesh of the otter to be eaten. It is said to be dark-colored, rank and of fishy taste. The fur is used, but not to any great extent. The sea-otter, *Enhydris,* is confined to the shores of the North Pacific. It is more aquatic than the species of *Lutra,* and has been found as much as 15 miles from land. Its tail is flattened as a paddle. It only walks with the greatest difficulty. The fur of the sea-otter is rare, silky and valuable. Consult Coues, 'Fur-bearing Animals' (1877); Stone and Cram, 'American Animals' (1902), and works on British and East Indian mammals.

OTTER, or **ANCON SHEEP,** a breed of sheep, which arose in Dover, Mass., in 1791, from a long-bodied ram which was deformed in that its legs were extremely short and bent outward, or bowed, like those of an otter. The progeny of this ram when mated with an ordinary ewe were often deformed like the sire, and for a long period the breed was easily maintained in that district, where it was esteemed because unable to jump over low walls and fences. This case is of great scientific interest as an example of Mendelian dominance (see HEREDITY) in a sire and also as an example of how a sudden variation or sport may be perpetrated. It is also of interest to note that when, after a time, care was no longer taken to maintain the breed, on account of the introduction of the quiet merinos, it disappeared by crossing with ordinary sheep: the last typical specimen recorded died in 1813. Consult Humphreys, D., 'On a New Variety in the Breeds of Sheep' (*Philosophical Transactions of the Royal Society,* London 1813).

OTTER CREEK, a stream rising on the southern boundary of Rutland County, Vt., flows north-northwest through Rutland and Addison counties and empties into Lake Champlain near Ferrisburg. It is 90 miles long and is navigable for eight miles from its mouth. It supplies excellent water power to a number of towns, the most important of which are Vergennes, Middlebury and Rutland.

OTTER-HOUND, or **OTTER-DOG,** a large, rough-haired, powerful, hardy and courageous breed of hounds, cultivated especially in Great Britain to assist in otter-hunting. These dogs must be able to follow the game into the water and fight it in its retreats. A fair specimen will stand two feet tall and weighs 65 to 75 pounds. Consult Lee, 'Modern Dogs' (1897).

OTTER-SHREW, a very large South African aquatic shrew, which has a strange resemblance in appearance and habits to an otter. See POTAMOGALE.

OTTERBEIN, ŏt'tĕr-bīn, **Philip William,** American United Brethren clergyman: b. Dillenburg, Germany, 4 June 1726; d. Baltimore, Md., 17 Nov. 1813. He was ordained in the Reformed (German) Church ministry at Herborn in 1749 and in 1752 was sent as a missionary to America, where he first settled at Lancaster, Pa., thereafter having charge of the congregations at Tulpehocken and York, Pa., and of Frederick, Md. At Lancaster he experienced what he termed a change of heart and as a result introduced the innovations of class-meetings, open-air meetings and prayer-meetings, and frequently made lengthy itinerant tours, founding what later became a new sect, the United Brethren in Christ. In 1774 he assumed charge of the parish at Baltimore where he remained for nearly 40 years. He was a man of great learning and wide influence; he co-operated with the Methodist preachers who came to Pennsylvania and Maryland; the movement which he headed gradually developed a separate organization; in 1800 he was elected bishop; and at his death the church had in its service about 100 preachers and 20,000 members. Consult 'Life,' by Drury (1884).

OTTERBEIN UNIVERSITY, founded in 1847 at Westerville, Ohio, under the auspices of the United Brethren in Christ. It was chartered with full university privileges, and was the first educational institution established under the control of the United Brethren; it was named in honor of Philip William Otterbein (q.v.). Its organization includes a college department, a preparatory department, with a three-years' course, and post-graduate, normal, music and art departments. The college work is arranged in two courses, classical and philosophical, leading to the degrees of A.B. and Ph.B. The university has been coeducational from the first; and there is a dormitory for the women students on the campus. The Christian Association building was the first of its kind in the State. In 1916 the library contained 19,000 volumes; the buildings and grounds were valued at over $525,000; the productive funds amounted to $250,000, and the annual income was $55,000. The students numbered 510 and the faculty 27.

OTTLEY, ŏt'lĭ, **Robert Lawrence,** English Anglican clergyman: b. Richmond, Yorkshire, 2 Sept. 1856. He was educated at Oxford, took orders in the Established Church, was principal of Pusey House, Oxford, in 1893, has been rector of Winterbourne Basset, Wiltshire, from 1897 and canon of Christ Church, Oxford, and Regius professor of pastoral theology at Oxford since 1908. He has published 'Lancelot Andrewes' (1893); 'The Doctrine of the Incarnation' (1895); 'Aspects of the Old Testament' (1897); 'The Hebrew Prophets' (1898); 'Short History of the Hebrews' (1901); 'The Grace of Life' (1903); 'The Religion of Israel' (1905); 'Christian Ideas and Ideals' (1909); 'The Rule of Faith and Hope' (1911); 'The Rule of Life and Love' (1915); 'The Rule of Work and Worship' (1915).

OTTO, King of Bavaria: b. Munich 1848; d. Furstenried, near Munich, October 1916. Otto Wilhelm Luitpold Adalbert Woldemar became king in 1886, when his elder brother, King Ludwig II, was declared insane. The latter drowned himself and his doctor — who tried to save him — in Starnberg Lake. But Otto had already been declared insane as well, some 10 years earlier, and had been confined near Munich under restraint. His uncle, Prince Luitpold, acted as regent from 1886 to 1912, when he died. It was then decided to depose the insane "king in name only" and make his cousin, Ludwig III, the present ruler, king in his stead. The family taint overcame Otto in the early seventys. Though he displayed no sign of intelligence or any human qualities, his enormous natural physical strength held out for over 40 years of his incarceration.

OTTO, John Conrad, American physician: b. near Woodbridge, N. J., 1774; d. 1844. In 1792 he was graduated at Princeton with the degree of A.B., after which he attended the medical department of the University of Pennsylvania, where he was graduated with the degree of M.D. in 1796. He established his practice in Philadelphia and from 1813 to 1838 was physician and clinical lecturer at the Pennsylvania Hospital. Dr. Otto was the first physician to report hæmorrhagic disposition as an hereditary trait in certain families. Consult his 'Account of an Hæmorrhagic Disposition in Certain Families' (1803).

OTTO. See OTHO.

OTTO ENGINE. See INTERNAL COMBUSTION ENGINE.

OTTO AND LANGEN ENGINE. See INTERNAL COMBUSTION ENGINE.

OTTO OF ROSE. See ATTAR.

OTTOIA, ŏt-tō'yạ, a genus of fossil annelids found in the Burgess shale of certain formations in British Columbia. It has an elongated cylindrical body, made up of several segments. The mouth is surrounded by a ring of hooks.

OTTOMAN (ŏt'ō-mạn) **EMPIRE,** or **EMPIRE OF THE OSMANLIS** (*Osnali Vilayeti*), formerly comprehending all the tributaries really or nominally under the dominion of the Sultan of Turkey. See TURKEY.

OTTUMWA, ō-tŭm'wạ, Iowa, city, county-seat of Wapello County, on the Des Moines River, and on the Chicago, Burlington and Quincy; the Chicago, Rock Island and Pacific; the Iowa Central; the Chicago, Milwaukee and Saint Paul and the Wabash railroads, about 80 miles southeast of Des Moines. It was settled in 1849 and in 1851 was incorporated. It is in a productive agricultural region in which there are extensive gold and coal-fields. It has good water power which combined with abundance of coal tends to develop manufacturing industries. The chief industrial establishments are mining and agricultural implement works, foundries, iron works, pork-packing plant, flour mills, starch factory, coal and lumber yards, manufactories of boilers, engines, tools, wagons, brick and tiles, cigars, and grain elevators. It has a large trade in the manufactures, coal, farm products, livestock and fruit. The prominent buildings are the United States government buildings, the Young Men's Christian Association building, opera-house, the Union Railroad Station, courthouse, churches, schools and library. The educational institutions are Saint Joseph's Academy, a high school, public and parish schools and a public library. It is under the commission form of government. The waterworks are municipal property. Pop. 23,586.

OTUMBA, ō-toom'bä, Mexico, town, state of Mexico, on the Mexican railroad, 30 miles northeast of the City of Mexico. It is the ancient Indian pueblo of Otompan, inhabited probably by the Otomi Indians. Here Cortes defeated the Aztecs in a desperate battle 7 July 1520 during his retreat from the City of Mexico. Pop. 2,500.

OTWAY, ŏt'wā, **Thomas,** English dramatist: b. Trotton, Sussex, 3 March 1652; d. Tower Hill, London, 14 April 1685. He was educated at Winchester College, and at Christ Church, Oxford. An appearance on the stage in Mrs. Aphra Behn's company in London in 1671 was unsuccessful and he returned to Oxford for a time, only to leave without a degree in 1674, and after a year in the army to return to London as an author. 'Alcibiades' (1675) and 'Don Carlos' (1676), especially the latter, which may be paralleled with Schiller's play, being taken from the same French original by St. Real, were unusually well received and won for Otway the favor of Betterton. Adaptations of Molière and Racine followed, one of which, 'The Cheats of Scapin,' held the stage for 100 years. In 1678 Otway essayed the comic with the prose play 'Friendship in Fashion,' another great success in his own day, though marked by much indecency. But Otway did not profit by his success, what with drink and various amours, notably his passion for Mrs. Barry, who played in most of his plays and was mistress of the Duke of Rochester. He left London for the army (1678–79), and upon his return wrote 'The Orphan' (1680), a comedy called 'The Soldier's Fortune' (1681), 'Venice Preserved' (1682) and another comedy, 'The Atheist' (1684). The two comedies are little better than worthless; whereas the two tragedies, 'Venice Preserved' ranking the higher, are by far the most powerful of the contemporary stage, being remarkable particularly for the simple and strong delineation of the passions, and being generally held the most pathetic and provocative of tears of the whole English drama. Otway wrote much miscellaneous verse, satires, dedications, prologues and epilogues, but all contemporary and early biographers agree that he died in want, though they differ as to details. 'Venice Preserved' enjoyed a European repute, there being versions in French, Dutch, German, Russian and Italian; with 'The Orphan' and 'The Soldier's Fortune' it is contained in the 'Mermaid Series' (1891). (See VENICE PRESERVED). A complete edition of Otway is that by Thornton (1813). Consult De Grisy, 'Etude sur Thomas Otway' (1868); Mosen, 'Ueber Thomas Otways Leben und Werke' (1875); Löwenberg, 'Ueber Otways und Schillers Don Carlos' (1886).

OUACHITA (wäsh'ĭ-tạ) **COLLEGE,** established at Arkadelphia, Ark., in 1886, under the control of the Baptist denomination. The work of the college is in two courses, classical and literary, and the degrees of bachelor of arts and bachelor of letters are conferred. There is also a preparatory department. The college is coeducational, and the number of women in attendance averages about one-half the total number of students. The income is derived from tuition fees, there being no endowment; in 1917 the income amounted to $75,000; the grounds and buildings were valued at about $100,000. The library contained 7,000 volumes; the students numbered 375 and the faculty 26.

OUAKARI, wä-kä're, a South American monkey of the genus *Brachyurus,* remarkable for the extreme shortness of the tail, and for the great length of the whitish hair upon the body, while the head is almost bald and the bare skin of the face is brilliant red. These small monkeys abound in the Brazilian forests, where three species are known, and one of which (*B. uakaria*) is among those most often seen and best liked as pets. Consult Bates, H. W., 'The Naturalist on the River Amazon.'

OUANANICHE, wä-nä-nēsh', a land-locked relative of the Atlantic salmon, named *Salmo ouananiche,* and often written winninish, wananiche and in various other ways. It inhabits various lakes and ponds in eastern Quebec and Labrador, but is most familiar in and about Lake Saint John, north of Quebec. From most of its stations it can go to and return from the sea if it pleases, but never seems to do so. This salmon differs very little from a typical salmon except in its smaller size, and most ichthyologists have held it, and the similar Sebago salmon, to be only local varieties of *Salmo salar;* but Jordan now regards both as separate species. The largeness of the eye and of the black spots are conspicuous distinguishing characteristics among others. «As a game fish,» says Jordan, «those who have had experience with the ouananiche think it has no equal. They may be taken at any time between the going out of the ice and the middle of September, though the best fishing is said to be late in May. During the early part of the season it may be taken with bait of worms, pork, pieces of chub or even ouananiche itself along the shore of Lake Saint John. It is occasionally taken then with the artificial fly, but fly-fishing for the ouananiche is usually not a successful method of capturing it.» The literature of American angling abounds with descriptions of this fish and its sport, and special treatises upon it have been written by McCarthy, Chambers, Van Dyke and others.

OUBLIETTE, oo-blĭ-ĕt′, a secret dungeon or pit constructed in old castles, forts and other buildings, in which were confined persons condemned to perpetual imprisonment or to secret death. It was usually entered by a staircase or steps reaching to the top of the chamber, in the floor of which was an opening into the dungeon. This opening served also for the admission of light and air.

OUDENARDE, oo′dĕ-närd′, or **OUDENAARDE**, Belgium, town in the province of East Flanders, on the Scheldt, to the southwest of Ghent 15 miles, and at the junction of the Brussels-Kortrijk, the Oudenarde-Mouscron and the Blaton-Ghent railways. It contains a number of remarkable buildings, among them the recently restored late Gothic, 16th century Rathaus with its portals by Paul van der Schelden, a masterpiece in wood carving; the Walpurgis Church (partly Romanesque of the 12th century and partly 14th and 15th century Gothic); the Liebfrauenkirche, an 18th century transition edifice; the School of Music, Bishop's College, etc. Its chief industrial resources are derived from the linen and cotton factories, bleacheries, dyeing establishments and tanneries. The old tapestry industry exists no more. This was the location in 1708 of the decisive victory of the allies under Marlborough and Prince Eugène of Savoy over the French under Vendôme and the Duke of Burgundy. It belonged to France from 1745–48. In 1910 it had a population of 6,956. Consult de Pauw 'La conspiration d'Oudenarde, 1342' (Ghent 1879). The town fell within the area of the German occupation early in the European War.

OUDH, owd, or **OUDE**, British India; (1) a town (also called Ajodhya) on the right bank of the Gogra, 77 miles east of Lucknow and forming part of the municipality of Fyzabad. It is greatly venerated by Hindus; but its ancient temples are in ruins, and its only structures deserving notice are a mosque built by Babar, and some Mohammedan tombs. Pop. 23,000. (2) A province politically attached to and forming with Agra the United Provinces of Agra and Oudh (q.v.) prior to 1901 known as the Northwest Provinces. Oudh is bounded on the north by Nepal and on the other sides by Agra, the lieutenant-governor of which administered Oudh as chief-commissioner from 1877 to 1902. Oudh is distinguished by an independent judicial system. The area is 23,966 square miles; the surface mostly level, very fertile and watered by the Gogra, Gunti and other tributaries of the Ganges. The Ganges itself forms nearly all its southwest boundary. There is a large forest area in the north. Oudh was formerly a Mogul province, and became subordinate to the British after the battle of Kalpi in 1765. In 1801 Gorakhpur and some other eastern districts were annexed from this territory to the British dominions. In 1819 the vizier threw off his nominal dependence on the Mogul sovereign and assumed the title of king. A disputed succession, and partial revolt in 1837, were the chief subsequent events until 1856, when complaints of misgovernment led to the annexation of the country to the British dominions, an annual pension of £120,000 being settled on the king. This measure, however, produced much dissatisfaction, and when, in 1857, the Mutiny broke out, most of the Oudh sepoys joined it, and the siege of Lucknow resulted. (See INDIAN MUTINY). Agriculture has made great advances, the area under crop having largely increased. Wheat, barley, rice, sugar, indigo and other products are raised in large quantities; in some districts a vast amount of nitre effloresces on the soil. Over 73 per cent of the population is engaged in agriculture; the province contains what is probably the densest rural population of any equal area in the world. Oudh is rich in historical sites. The province includes the two divisions of Lucknow and Fyzabad. Lucknow is the capital; other towns are Myzabad, Shahabad and Bharaich. Pop. 12,558,004 (predominantly Hindu; Mussulmans 1,700,000). See UNITED PROVINCES OF AGRA AND OUDH.

OUDINOT, oo′dĕ-nō, **Charles Nicolas**, DUKE OF REGGIO, French marshal: b. Bar-le-Duc, France, 26 April 1767; d. Paris, France, 13 Sept. 1847. Entering the army he had attained the rank of captain at the outbreak of the Revolution. He joined forces with the populace but crushed an uprising in his native district in 1790, and in 1794 was given command of a brigade. In the war with Prussia and Austria he won distinction, in 1799 became general of division, and was thereafter much trusted by Napoleon, receiving the command of 10 battalions in 1805. He was at Austerlitz and Jena, and at Ostrolenka, Russia, in 1807 he routed the Russians; at Friedland in 1807 and at Wagram in 1809 his bravery was so marked that after the latter battle he was made marshal of France and Duke of Reggio. In 1810 he occupied Holland, and in the unfortunate campaign against the Russians in 1812 he earned high praise for his skilful generalship. In the battles between the French and the allies he played a prominent part, was defeated at Gross Beeren and engaged at Leipzig; and he was loyal to Napoleon to the last, but after the restoration of the Bourbons took office under them. In 1823 he led the invading army into Spain, acted as governor of Madrid for a time, and became governor of the Invalides in 1842.

OUDINOT, Charles Nicolas-Victor, DUKE OF REGGIO, French general, son of the preceding: b. Bar-le-Duc, France, 3 Nov. 1791; d. Paris, France, 7 July 1863. He was a prominent figure in the war in Algeria, was later appointed commander-in-chief, and in 1848 led the attack upon Rome. For his protests against the *coup d'état* in 1851 he was arrested, but his release followed shortly, whereupon he retired from public life.

OUGREE, oo′grā′, Belgium, town in the province Liége, on the Maas and the Liége-Namur Railway. It has extensive blast furnaces, rolling mills, machine works and coal mines. In 1910 it had 17,088 inhabitants.

OUIDA, wē'dạ, pen name of **Maria Louise [de la] Ramée,** English novelist: b. Bury, Saint Edmunds, 7 Jan. 1839; d. Florence, Italy, 25 Jan. 1908. Her father, Louis Ramée, was said to be of Norman (Jersey) extraction; her mother, Susan Sutton, was English. In her teens she went to live in London and began to write for *Colburn's New Monthly Magazine* and for *Bentley's Magazine*. Originally published in serial form as ‘Granville de Vigne: A Tale of the Day,’ her first novel appeared in book form as ‘Held in Bondage’ (1863). Using as a pseudonym her Christian name as pronounced by a baby sister, there speedily followed ‘Strathmore’ (1865); ‘Chendos’ (1866); and ‘Under Two Flags’ (1867), which established her reputation as a story-writer. Exceedingly dramatic, abounding in high-pitched sentiment and attractive description, unconventional, of doubtful morality and taste, they possessed, however, undoubted literary merit with a strong popular appeal. Among notable later books were ‘Tricotrin’ (1869); ‘Puck’ (1870); ‘A Dog of Flanders, and Other Stories’ (1872); ‘Two Little Wooden Shoes’ (1874). In 1874 Ouida went to live in Florence where she wrote ‘Moths’ (1880); ‘In Maremma’ (1882); ‘Bimbi: Stories for Children’ (1882); ‘Ruffino’ (1890); ‘The New Priesthood’ (1893); ‘The Mascarenes’ (1897); ‘The Waters of Edera’ (1900); ‘Street Dust’ (1901). She acquired considerable wealth by her writings but due to her extravagant mode of living and her pride in refusing assistance of friends she was always in financial difficulties. The Italian government made her a generous grant of money; the British government granted her a civil list pension which was augmented by another from the English Literary Fund, but her last years and death were marked by tragic poverty.

OUIMET, wĕ'mĕ', **Joseph Alderic,** Canadian statesman: b. Sainte Rose, Quebec, 20 May 1848. He was educated at the Seminaire de Sainte Thérèse and at Victoria University, Cobourg. In 1870 he was called to the bar and practised thereafter at Montreal where he was soon recognized as one of the foremost legal lights in the province. From 1873 to 1896 Ouimet sat in the Dominion House of Commons as Conservative member for Laval. In 1887–91 he was speaker of the House and served as Minister of Public Works from 1892 to 1896. For the 10 years from 1896 to 1906 Ouimet served as puisne judge of the Court of King's Bench of Quebec province.

OUISTITE, wĭs'tĭ-tĭ. See MARMOSET.

OULESS, oo-lĕs, **Walter William,** English painter: b. Saint Heliers, Jersey, 21 Sept. 1848. He was educated at Victoria College in his native town, and at 16 became a student at the Royal Academy, where he was a constant exhibitor after 1869. He was elected an associate in 1877 and a full member in 1881. About 1872 he applied himself to portrait-painting, in which he attained a high rank. Among his sitters were Darwin, Bright, Cardinals Newman and Manning, Lord Roberts, Frederic Harrison and the Duke of Cambridge. He was awarded a gold medal at the Paris International Exhibition of 1878, and also at the Berlin Exhibition of 1886.

OUNCE, (1) the snow-leopard (q.v.); (2) in South America the jaguar (q.v.).

OUNCE, a twelfth part of any magnitude, whether of length, surface or capacity. In Troy weight the ounce is the 12th part of the pound; in avoirdupois the ounce is the 16th part of a pound. See WEIGHTS AND MEASURES.

OUR AMERICAN COUSIN, an English comedy by Tom Taylor, produced in 1858. There is a Yankee character in the play, originally created by Joseph Jefferson (q.v.). Lincoln was in attendance at a performance of this comedy at Ford's Theatre, Washington, when he was assassinated.

OUR LADY OF ANGELS, Seminary of, Niagara Falls, N. Y., the ecclesiastical department of Niagara University (q.v.), founded 21 Nov. 1856. The object of the seminary is the training of candidates for the Catholic ministry. The scholastic year extends from September to June and consists of two terms. The first term ends on the 1st of February; the second ends with the close of the scholastic year. The course of studies embraces two years of philosophy and four years of theology. Recitations are in Latin. Two oral and two written examinations are held every year. Scholastic disputations in dogmatic theology and philosophy and the solving of «cases of conscience» in moral theology are a part of the regular class work. The seminary is under the care of «The Priests of the Congregation of the Missions» (Vincentians or Lazarists). «Old Niagara» as the seminary is affectionately called, celebrated its 60th anniversary in 1916, with a commemoration of the hundreds of priests «men rich in virtue and endowed with wisdom,» who from its classes entered the ministry and throughout the nation in the churches, schools and charitable institutions which they were instrumental in creating, reared noble monuments to their zeal, devotion and self-sacrifice.

OUR LADY OF GOOD COUNSEL, Sisters of. See ORDERS, RELIGIOUS.

OUR LADY OF THE HOLY ROSARY, Congregation of. See ORDERS, RELIGIOUS.

OUR LADY OF LOURDES. See ORDERS, RELIGIOUS.

OUR LADY OF LOURDES, Brothers of. See ORDERS, RELIGIOUS.

OUR LADY OF MERCY, Military Order of. See ORDERS, RELIGIOUS.

OUR LADY OF PERPETUAL HELP, Sisters of. See ORDERS, RELIGIOUS.

OUR LADY OF SION. See ORDERS, RELIGIOUS.

OUR MUTUAL FRIEND, a novel by Charles Dickens, published in England in 1864–65. The scene is laid in London and its immediate neighborhood. Among the characters which this story has made famous are Miss Jenny Wren, the doll's dressmaker; Bella Wilfer, «the boofer lady»; the Golden Dustman, Mr. Boffin; and Silas Wegg, employed by Mr. Boffin, who is at first delighted with the services of «a literary man with a wooden leg.»

OURAY, oo-rā', Indian chief: b. Colorado, 1820; d. Los Pinos Indian agency (Colo.) 24 Aug. 1880. He was the leader of the Uncompahgre Utes, and while protecting the interests of his tribe was friendly to the whites, with whom he always kept faith. He spoke both English and Spanish. Several times he visited Washington to appeal on behalf of his people.

OURAY, Colo., town, county-seat of Ouray County, on the Uncompahgre River and on the Denver and Rio Grande Railroad, 160 miles west-southwest of Colorado Springs. It is at an elevation of over 7,000 feet, at the base of Mount Hayden, and in a region of grand mountain scenery. Its hot springs make it a favorite health resort. It is also the local trade centre and shipping point of the surrounding mining region, which is rich in gold and silver. It contains a miners' hospital. Pop. 1,644.

OURIQUE, ō-rē'kĕ, Portugal, town in the province Alemtijo, and celebrated on account of the victorious battle of this name gained (1139) by Alfonso I over the Moors near here. The battle assured him the kingdom of Portugal.

OURO-PRETO, ō'roo prā'too, Brazil, city, state of Minas Geraes, 175 miles north of Rio de Janeiro; elevation, 3,800 feet. Rich gold deposits were found in the vicinity and the chief industry was formerly gold-mining, but the mines have mostly been abandoned and the prosperity of the city has in consequence declined. It was originally the capital of Minas Geraes, but the state government was moved to Minas in 1894. It is built on several hills and surrounded by mountains; the streets are narrow and irregular, but some of the modern houses are well built. It is connected with Rio de Janeiro by rail, and with the towns to the north and east by highway, and carries on an active trade. Pop. 15,000.

OUSE, ooz, England, (1) a river of Yorkshire also called the NORTHERN or YORKSHIRE Ouse, formed by the junction of the Swale and Ure, and after a southeast course of 45 miles, uniting with the Trent to form the estuary of the Humber. Its principal affluents are the Wharfe and the Aire from the west, the Don from the south and the Derwent from the north. (2) The GREAT OUSE rises near Brackley in the county of Northampton, flows in a general northeasterly direction, traverses the counties of Buckingham, Bedford, Huntingdon, Cambridge and Norfolk, and falls into the Wash at King's Lynn, after a course of 156 miles, for the latter two-thirds of which it is navigable. Among its affluents is (3) the LITTLE OUSE or BRANDON RIVER which, after a course of 30 miles, joins it at the confluence of the river Stoke, and the New Bedford and Wisbech Canal.

OUSELEY, ooz'lĭ, SIR **Frederick Arthur Gore,** English composer and musician: b. London, 12 Aug. 1825; d. Hereford, 6 April 1889. He was a son of Sir Gore Ouseley (q.v.). He was graduated B.A. in 1846 from Christ Church, Oxford; succeeded to the baronetcy by his father's death in 1844, took orders, and held several metropolitan curacies from 1849 to 1851. Having graduated as doctor of music at Oxford in 1854, he was appointed precentor of Hereford Cathedral in the following year, and also became professor of music in the university. In 1866 he was made a canon residentiary of Hereford Cathedral. From earliest childhood Ouseley showed remarkable musical ability and extraordinary accuracy of ear. He composed an opera of great promise when only eight. His published compositions include two oratorios, 'The Martyrdom of Saint Polycarp' (1855), and 'Hagar' (1873); nearly 100 anthems, and many other compositions of a religious nature; besides overtures, glees, solos and quartets. He wrote three valuable works on musical theory: 'A Treatise on Harmony' (1868); 'A Treatise on Counterpoint, Canon and Fugue' (1869); and 'A Treatise on Musical Form and General Composition' (1875). He was the founder of the church and college of Saint Michael, Tenbury (1856), and to it bequeathed his splendid musical library.

OUSELEY, Gideon, Irish Methodist missionary: b. Dunmore, Galway, 24 Feb. 1762; d. Dublin, Ireland, 13 May 1839. His father, who belonged to a family settled in Ireland since 1625, was a deist, who, however, brought up his son with a view to his entering the Roman Catholic priesthood. A frivolous youth was followed by marriage at 20 and by the dissipation of both his own and his wife's fortunes. A severe gunshot wound deprived him of the sight of one eye; at the same time he came under the influence of pious Methodist soldiers, was converted in 1789, began work as a preacher; in 1792 he and his wife opened a girls' school at Sligo, and in 1799 he was received into the Methodist conference. For 50 years he preached the gospel, largely in the nine Ulster counties, addressing thousands of gatherings, chiefly in the open air at fairs, wakes, etc., and generally speaking from horseback. During the rebellion of 1798 he was in peril for his life; but the heart-reaching power of his discourses, his fire and enthusiasm, joined to the Irish grace of humor, made his zealous labors acceptable not only to Wesleyans but to other Protestant denominations. He would preach as many as 20 sermons a week. He was the author of some controversial works, including 'A Short Defence of the Old Religion' (1812); 'Rare Discoveries' (1829). Consult the 'Memoir' by Reilly (1847); and the 'Life' by Arthur (1876).

OUSELEY, SIR **Gore,** English diplomat and Orientalist: b. Limerick, Ireland, 24 June 1770; d. Beaconsfield, Buckinghamshire, England, 18 Nov. 1844. In 1787 he went to India, where he engaged in business, and also gave considerable attention to the study of Oriental languages and customs, particularly the Persian, Bengalese and Hindu. After his return to England he was created a baronet (1808), and in 1810 was appointed English Ambassador Extraordinary to Persia, and through his intimate knowledge of the Persian language and his skilful diplomacy was successful in arranging a treaty between England and Persia, which was concluded in 1812 but never finally ratified. He was also instructed in 1813 to mediate between Russia and Persia, and through his efforts a treaty was signed suspending war between the two nations. In 1815 he returned to England, and in 1820 was admitted to the privy council. He was an able Oriental scholar, was one of the founders of the Royal Asiatic Society of London, and in 1842 became president of the Society for the Publication of Oriental Texts. 'The Gulistan of Musle-Huddeen Shaik Sâdy of Sheerez' was printed under his direction (1809); his own work, 'Biographical and Explanatory Notes on the Persian Poets' was published after his death (1846).

OUSELEY, Sir **William,** English Orientalist: b. Monmouthshire, England, 1767; d. Boulogne, France, September 1842. He was educated privately and later in Paris, but in 1788 he entered the army. Tiring of military life and desirous of continuing his study of Oriental languages, he left the army in 1794 and entered the University of Leyden. Thereafter he devoted himself to further study and to literature, and was knighted in 1800, but in 1810 accompanied his brother, Sir Gore Ouseley, Amabssador to Persia, as his private secretary. He published 'Persian Miscellanies' (1795); 'Oriental Collections' (1797–99); 'Travels in Various Countries of the East' (1819–23), and translated the geography of Ibn Haukal (1800).

OUSELEY, Sir **William Gore,** English diplomat: b. London, 26 July 1797; d. there, 6 March 1866. He was the son of Sir William Ouseley (q.v.). He was early engaged in the diplomatic service; and in 1825 was connected with the British legation at Washington, and at that time married a daughter of Van Ness, governor of Vermont. He later was appointed to several responsible diplomatic positions in South America; and was sent on special missions to the United States and to Central America. He published 'Remarks on the Statistics and Political Institutions of the United States' (1832); 'Notes on the Slave Trade' (1850); and 'Views in South America, from Original Drawings' (1852). He was created K.C.B. in 1852.

OUSSANI, Gabriel, American Orientalist: b. Bagdad, Asiatic Turkey, 1 Aug. 1875. He was educated at the Patriarchal Seminary, Mosul, Turkey, at the Propaganda, Rome, also at Paris and at Johns Hopkins University, Baltimore, under Paul Haupt. He was ordained priest of the Chaldean rite and came to New York in 1900, was Fellow in Semitic languages at Johns Hopkins in 1901–04, and professor of Hebrew, ancient history and Italian at Cathedral College, New York, and lecturer on Biblical and Oriental history and archæology at Saint Joseph's Seminary, Dunwoodie, N. Y., in 1904–07. In 1907 Dr. Oussani was appointed professor of early church history, Old Testament history and patrology and librarian at Saint Joseph's Seminary. He visited the ruins of Assyria and Babylonia and traveled in the Levant for purposes of research. He is member of the American Oriental Society and the Society of Biblical Literature and Exegesis. He is a frequent contributor to periodicals and reviews and contributed also to 'The Catholic Encyclopedia.'

OUSTER, *in law,* the act of dispossessing one, as of a freehold or chattels real. An ouster differs from a trespass in that the latter is temporary and usually without claim to the property. Ouster of a freehold may be effected in three ways; by abatement, or wrongful entry before the heir or devisee, at the death of the person seized; by intrusion, or entry before the reversioner or the remainderman, at the death of the tenant for life; by disseisin, or expulsion of the person lawfully in possession. Ouster of chattels real is effected by disseisin only. In disseisin the expulsion must be forcible or fraudulent.

OUT OF THE CRADLE ENDLESSLY ROCKING. In the New York *Saturday Press* of 24 Dec. 1859 appeared a lyric poem by Walt Whitman entitled 'A Child's Reminiscences.' In the following year this title was changed to 'A Word out of the Sea.' The poem has finally come to be known by its initial line, 'Out of the Cradle Endlessly Rocking,' and has established itself not only as one of the finest of Whitman's lyrics but as one of the most suggestive and impressive poems in American literature. It is a reminiscence of a night in May in the poet's boyhood, on the coast of northern Long Island, under the moonlight, where a mocking-bird is calling for its dead mate, the sea is singing its song of death and the boy "is listening, absorbing, translating." Few poems have so entirely and exquisitely fused nature and human emotion; the "setting" formed of moonlight, the sea and the bird, is no mere background: in its reaction upon the boy it is the very soul of the poem (compare 'When Lilacs Last in the Dooryard Bloomed,' q.v.). In his chant of the mockingbird Whitman has succeeded more nearly than any other poet in rendering articulate the bird's song of joy and pain. From this song and the song of the sea, says the poet, "a thousand singers, a thousand songs, have started to life within me." Perhaps no other poem has with such pure emotion suggested the subtle and indescribable awakening of a poet's genius. Whitman's power of phrasing and wide variety of rhythm and harmony so entered into the making of this poem that the sympathetic reader leaves it with the sense of having witnessed a miracle, of having actually shared a profound emotional experience.

Marion Tucker.

OUTAGAMI, a name applied to the Fox Indians (q.v.).

OUTCROP, an exposure of rock. Specifically the term is limited to an actual exposure of the bedrock, without soil cover. The term, however, is used in a more expanded sense to indicate an area where a given bed of rock is the formation next under the surface soil, even though not actually exposed. For example, the Cambro-Ordovician outcrops over most of the central Ozarks, mean not that the Cambro-Ordovician actually is exposed over all that area, but that it is the rock next beneath the soil cover.

OUTDOOR THEATRES have recently found a wide revival in every part of the world, particularly in our own Western States. The uncertainty of the weather has always been a factor tending to retard the growth of the theatre out-of-doors, making the performances periodical or fitful, even in countries where fair weather is invariable. The classic performances in the amphitheatres of Athens, it will be remembered, were part of the religious seasonal celebrations and were not perennial. In this regard it should be remarked that the Shakespearean theatre was not an outdoor theatre, as it has been so often described, but a roofless theatre; and, therefore, something quite distinctive. On the other hand, the present-day garden theatres of Italy, like the theatres of ancient Greece, are wide open to all the winds. The most renowned of these are the stately garden theatre of Villa Sergardi, near Sienna in Tuscany; the little garden theatre, Villa Marlia, near Lucca, one of the best of its kind in all Italy; and, the largest garden theatre in that country, at Castelnuovo, near Palermo. This last has a wall of stucco built at the back of the stage lawn with painted scenery: a highly artificial and incongruous effect in a garden theatre. The Royal Garden Theatre in Dresden, Saxony, is one of the largest and best equipped on the Continent. In the United States a number of such theatres are owned by private persons; notably the 'Outdoor Players' extraordinarily beautiful Nature Theatre, belonging to Miss Marie Ware Laughton, at Peterboro, N. H.; one in the grounds of R. R. Conklin, Huntington, Long Island; a remarkably handsome, solid structure on the estate of George C. Booth, Cranbrook, Mich.; another at Brookside, Mount Kisco, N. Y.; and many more attached to universities and other educational institutions (see College Dramatics). A world-famous theatre is that built at Point Loma, near San Diego, Cal., by a theosophical order, the Universal Brotherhood Organization.

These, like practically all the large completed outdoor theatres of the United States, have been fashioned after the Greek model. Exceptions are found in those theatres that are rustic from necessity or by design. Of the latter type a fine specimen is the Redwood Forest Theatre of the San Francisco Bohemian Club, made famous by its annual original 'Bohemian Jinks,' in which men of national and international celebrity have been concerned. These festivals (for men only) have been partly described in the club volume edited by Mr. P. Garnett (San Francisco 1912) and a more recent list of the performances has been published in a special bulletin of the American Pageant Association. For excellent decorative and mechanical lighting effects for evening performances out of doors, consult the article in the *Architectural Review* (Boston, September 1916) by Mr. Claude Bragdon, an architect of accomplishment in this department, who spent many months in experimentation to achieve his remarkable effects. While many of the classics have been largely adapted to the outdoor theatres of all kinds, there exists, at the same time, a stronger and quite successful tendency toward bending writers to originate plays for the strict conditions of the open air. For the English outdoor play of the 17th and 18th centuries, consult Greg, W. W., 'Pastoral Poetry and Pastoral Drama' (London 1906), the most important work on the subject, containing a valuable bibliography. The French work on pastoral plays is Marsan, Jules, 'La Pastorale Dramatique' (Paris 1905). The German standard authority is Klein, J. L., 'Geschichte des Dramas' (Vol. V, Leipzig 1867).

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In the broader lines of outdoor theatricals consult articles listed under the special headings: College Dramatics; Community Drama; Festival; Masques; Pageant.

OUTLANDERS. See Uitlanders.

OUTLAWRY, an ancient custom in Great Britain of putting a person out of the protection of the law; thus an outlaw could be killed at sight like a wild beast; but once captured, his life was in the king's hands. Outlawry in civil proceedings was formally abolished in 1879. In an act passed in 1870, however, abolishing forfeitures for treason and felony, it was expressly stated that nothing in the act was to affect the law of forfeiture consequent upon outlawry. But there is little need now for outlawing absconders from justice, since in most cases they can be laid hold of under treaties of extradition with foreign countries. The effect of outlawry is the forfeiture of the goods of the outlaw to the Crown, and he cannot receive and hold property given or devised to him. In the United States, outlawry was recognized in the Colonial days, but since the War of the Revolution the practice has been obsolete.

OUTLIER, an isolated mass of younger rock entirely surrounded by older sediments. Outliers are usually the result of normal erosion, as for example the hard layer of rock capping a mesa (q.v.), which has been separated from the continuous layer with which it was once connected. Contrasted with outlier is inlier, a mass of older rock entirely surrounded by younger beds, as where an anticline (q.v.) has been planed down by erosion, exposing the older beds at the centre. Outliers and inliers may be formed in other ways.

OUTRAM, oo'trạm, Sir **James**, English soldier: b. Butterley Hall, Derbyshire, 29 Jan. 1803; d. Pau, France, 11 March 1863. He was educated at Marischal College, Aberdeen, and in 1819 went to India, where after commanding for some time a body of irregular troops he was appointed adjutant to the 23d Bombay Native Infantry. From 1835 to 1838 he was employed in subduing the rebel chiefs of the Mahhi-Kanta. In the last-mentioned year, as adjutant to Lord Keane, he took part in the Afghan War, and distinguished himself at the capture of Khelat, and by his dangerous ride in disguise through the enemy's country (1839). In various other capacities he displayed military talents of a high order, as well as admirable administrative qualities. In 1842 he was appointed commissioner to negotiate with the Ameer of Sindh, in which position he adopted views at variance with the aggressive policy of Gen. Sir Charles James Napier, and the consequence was an acrimonious correspondence between the two soldiers, carried on, however, by both in a spirit of good faith. Sir James had the satisfaction in the end of knowing that his views were confirmed by the directors. His opponent gracefully styled him publicly the Bayard of India. In 1843 he defended the residency of Haiderabad against 8,000 Sikhs; was resident of Baroda 1847–51; Oudh in 1854. He successfully conducted the war against Persia. He landed at Bushehr 27 Jan. 1857, and by a series of brilliant victories brought the war to a satisfactory conclusion in three months. At the beginning of the Mutiny he had command of two Bengal divisions, and was chief commissioner of Oudh. During the first relief of Lucknow, however, he waived his rank and served as a volunteer under Havelock. He commanded at Lucknow until the second relief (by Sir Colin Campbell), directed the evacuation, and held the place until the third relief. He was made lieutenant-general and was created a baronet in 1858. He was the author of several works on his campaigns.

OUTREMONT, oo'tr-môn̈, Canada, town in Jacques Cartier County, province of Quebec, on the Canadian Pacific, the Canadian Northern and Grand Trunk railroads, five miles northwest of Montreal. It is in the main a residential suburb of its great metropolitan neighbor and has none other than small local manufactures. The Cedar Rapids and Shawinigan Falls furnish valuable water power. Pop. 4,820.

OUTWASH PLAIN. See VALLEY TRAIN.

OUTWORKS, in warfare. See FORTIFICATION.

OUVRARD, oo'vrär, **Gabriel Julien,** French financier: b. near Clisson, Loire-Inférieure, 1770; d. England, 1846. Ouvrard became prominent as a financier during the Revolution, especially under the Directoire, when he became very wealthy. He lent huge sums to the state and also to Spain. Under the Napoleonic régime his financial operations grew apace and in 1802–04 he loaned the government about 300,000,000 francs. The great military campaigns of Bonaparte were financed by Ouvrard. A break with the emperor came and Ourvrard passed the years 1810–13 in prison. He was afterward sentenced to a term in prison for illegal methods on the Stock Exchange. After his release he went to live in England. He published a volume of 'Memoires' (1826).

OUZEL, oo'z'l, an old name, derived from the German, for several thrush-like birds of Great Britain and the United States. The name is sometimes applied in England to the blackbird (q.v.), and to the larger thrush (*Turdus torquatus*), distinguished by the broad lunate stripe of white across the breast and sides of the neck, which is provincially known as ring, rock, mountain or tor ouzel. The name is also given, in the form «water-ouzel,» to a small wren-like bird (*Cinclus aquaticus*), congeners of which occur in various mountainous parts of the world, all very similar in appearance and habits. One species (*C. mexicanus*), is common in the Rocky Mountain region — a small, robust, short-tailed, short-winged, dark-colored bird which haunts the mountain-streams and is commonly known as «dipper,» on account of its remarkable facility in diving. Its food consists almost exclusively of snails, young insects and other organisms which live in and about the streams; and it has the power of seeking these under water, not only by diving, but by partly swimming and partly walking with fluttering wings along the bottom in search of its prey, remaining there «two or three minutes» if it pleases. It is a common bird in both the Rocky Mountains and in the Coast Ranges; and makes a large globular nest of mossy materials which it lodges in some crevice near a stream, often beneath the veil of a cataract. Consult Muir, in *Scribner's Monthly* (1878); Keyser, 'Birds of the Rockies' (1902); Coues, 'Birds of the Northwest' (1874); and British ornithologies.

OVAMBO, ō-väm'bō, the Herero name for a people of the Bantu race residing in German Southwest Africa, calling themselves the Aajambo or «rich ones.» They are divided into separate tribes, among which the best known is the Aandonga, and are said to number about 80,000. They are of very dark complexion, tall and robust and remarkably ugly, and are physically much like their neighbors, the Herero (q.v.). The hair is short, crisp and woolly. The men often shave it off, leaving the crown untouched; but the women stiffen it with a kind of red paste, in the manner practised in many other parts of Africa. The principal ornaments are heavy iron anklets, a profusion of cowries and other shells and beads of every size and color, so arranged as to hide a considerable part of the person. The men also wear a leather clout. Their staple food is grain and they are primarily agriculturists. The houses are of a circular form, with a circuit of 16 feet and a height not much exceeding four feet. These huts, arranged in groups, are enclosed by strong palisades. The domestic animals are oxen, sheep, goats, pigs, dogs and poultry. The arms consist of bows and arrows, a dagger, assegais and knob-kerries. Though thus provided with weapons the Ovambo are peacefully disposed and industrious. There is a sharp division of labor between the various tribes. In the higher castes of nobles and priests, descent is traced by the mother. The chiefs have a despotic rule and there is a strong belief in sorcery.

OVANDO, ō-vän'dō, **Nicolás de,** Spanish soldier and administrator: b. Valladolid, Spain, about 1460; d. Madrid, Spain, about 1518. He was commander of the Order of Alcántara and politically one of the most powerful men of his day in Spain, where he was high in favor with Ferdinand and Isabel, joint sovereigns of the Spanish domains. In 1501 he was appointed successor to Boabdilla as governor of Hispaniola; in February 1502 he sailed from Spain with a fleet of 30 ships and 2,500 persons in his company and landed at San Domingo. Almost his first act as governor was to refuse aid to Columbus whom he would not allow to land at San Domingo and he permitted months to pass without sending aid when he knew Columbus was in sore straits at Jamaica. His treatment of the Indians was cruel in the extreme and one of the blackest deeds in his career was his treacherous massacre of the 84 caciques of Queen Anacaona at Xaragua and her subsequent execution. In the course of his despotic rule the number of Indians in his province was reduced to 60,000 in 1507 against 500,000 at the arrival of the Spaniards. Aside from his treatment of the Indians Ovando was an able governor and the colony flourished. He was recalled in 1509.

OVARIOTOMY. See OVARY.

OVARY, one of the paired glands which form the essential part of the organs of generation in the female, and produce the eggs or ova; it is homologous to the testis of the male, where spermatozoa originate. The ovaries are two elongated oval bodies, flattened from above downward, one on each side of the uterus, attached to the broad ligament. Each ovary is about one and one-half inches in length and one-third inch thick. It consists of many ovisacs or Graafian follicles or vesicles (in which the ova are developed), embedded in a stroma or framework, and also of blood vessels, nerves and lymphatics and is invested with a serous covering or membrane derived from the peritoneum. In females who have never menstruated, the surface of the ovary is smooth; after menstruation has been established it is rough and marked with scars, due to the rupture and closure of the Graafian vesicles. At undetermined periods, from puberty on, probably at or near the time of menstruation, the fluid (liquor folliculi) within certain ovisacs increases, distention of the sacs occurs and a rupture at the weakest point, with discharge of the ovum. This is ovulation, the function of the ovary. Most physiologists believe that ovulation is associated with menstruation, but some writers contend that menstruation may occur without accompanying ovulation, and vice-versa. Usually the ova, when discharged, are conveyed through the Fallopian tubes (q.v.) to the uterus. If the ovum unites with the spermatozoa of the male it becomes impregnated or fertilized. After the discharge of the ovum the Graafian vesicle usually fills with blood, which coagulates. The coagulum, squeezing out the serum, becomes decolorized, its periphery assumes a yellowish color and the resultant spot is the corpus luteum. The corpus luteum of pregnancy is larger and remains for a longer time than that formed when pregnancy does not occur. Ovarian grafting now occupies a recognized position in pelvic surgery, operations having been followed by most excellent results.

Diseases of the Ovaries.— The affections of the ovaries may be classified as malformations, displacements, functional disorders, inflammations and tumors. One or both ovaries may be congenitally absent. This condition is rare, and when it does occur it generally coexists with a want of development of the vulva, vagina and uterus. Sometimes the ovaries are undeveloped. In both these conditions the women lack constitutional vigor and development. Displacement of the ovary into the inguinal canal, or labia majora (hernia), is generally congenital, but may be caused by a strain or fall. Prolapse or dislocation of the ovary, causing it to sink downward toward the pelvic floor, results from a disturbance of the delicate adjustment of the organ, by an abnormal increase in its weight, a weakening of its supports or an unusual traction upon it. The functional affections are neuralgic in character. Ovarian neuralgia (ovarialgia or oöphoralgia), of which the principal symptom is sharp local pain, is frequently associated with hysteria or other neuroses, headache, intercostal neuralgia, etc., and it may be caused by a local engorgement or induration pressing on sensitive nerves. Inflammation of the ovary (ovaritis or oöphoritis) may be acute or chronic. The acute form is often preceded by hyperæmia, or an excess of blood-supply at the time of the monthly period, from some obstruction of the venous circulation. Pain in the ovarian region, especially during menstruation, inability to walk and painful defecation are the principal symptoms of acute ovaritis. The inflammation is frequently associated with pelvic cellulitis and peritonitis and may be caused by injuries, gonorrhœal infection, puerperal sepsis and the acute exanthemata. Sometimes abscesses form, or sterility results. Chronic ovaritis is usually the result of an inflammation, acute or subacute, but may be caused by self-abuse, sexual excitement, etc. The connective tissue of the ovary thickens, decreasing the size of the organ (cirrhosis) and tends to the formation of cysts, that is to say, cystic degeneration. A sickening pain, tenderness and reflex neuralgias are symptoms. The tumors of the ovary are carcinoma, fibroma and papillomatous tumors. Pathological atrophy sometimes accompanies excessive obesity, while prolonged pressure by adhesions or tumor, interference with the vascular supply and removal of the uterus also cause this condition. Physiological atrophy follows the menopause. Hypertrophy may be caused by any inflammatory process which stops short of the formation of pus, as chronic constipation, prolapsus of the ovary, etc. Pure hypertrophy is very rare as is also tuberculosis of the ovary.

Ovariotomy.— This is the operation of modern surgery for removal of ovarian tumors or of ovaries themselves. It was first performed in the 18th century by Ephraim McDowell of Kentucky, and long considered exceedingly dangerous, but has been performed with great and increasing success, especially since the adoption of antiseptic treatment. See ANATOMY, COMPARATIVE; and consult 'Reference Handbook of the Medical Sciences' (Vol. VI, New York 1916).

OVEN, a closed, box-like chamber of any description in which a considerable degree of heat may be generated, used for baking, heating or drying any substance. The term is usually restricted to a close chamber for baking bread and other food substances; but ovens are also used for coking coal, in the art of metallurgy, in glass-making, pottery, etc. There is now a great diversity in the shape and materials of construction and modes of heating ovens. The old type of baker's oven, still very largely used, is a low arched chamber either of brick with a tile or stone sole, or built entirely of stone. The door is in front and the pans of dough are put in with a long wooden spade. In one class of these ovens the fireplace or furnace is placed in the front corner, with an opening admitting the products of combustion directly into the oven, while there is an exit flue on the other side. A remarkable apparatus for the economic preparation of food both as regards the expenditure of fuel and the saving of waste is the Aladdin Oven, invented by Edward Atkinson, of Boston. This apparatus has been developed from a study of the Scandinavian Cooking Box, much used in Norway and Sweden. This box consists of an outer case of wood or other non-heat-conducting material, lined with hair felt. Into this cavity a metallic box, containing food with sufficient liquid heated to the boiling point, is placed and tighly closed in. The heat is thus retained for a long period, completing the process of cooking. On this basis was devised an outer oven of non-heat-conducting material in which, separated by a sufficient space for the circulation of heat, is placed a metallic oven or cooking chamber. Heat is passed from the top of a round-wicked kerosene lamp through a hole in the bottom of the outer oven. This heat passes around the entire inner oven, the products of combustion passing out at the same orifice at which the heat entered. There is no direct communication between the lamp or source of heat and the cooking chamber. By this apparatus a normal temperature can be maintained for a definite number of hours, either at the temperature of simmering or stewing at about 160° F., or at the temperature for baking and roasting not exceeding 300° to 320° F. By suitable arrangements thereto very little difference in temperature is found between the top and the bottom of the oven. The heat can be regulated by the size of the lamp and height of the flame. Meats, fish, vegetables and puddings can be cooked in the same chamber without the flavor of one being imparted to the other, the heat being kept below the distilling point of the animal fats or of the fruit and vegetable juices. In this apparatus two pounds of kerosene oil are computed to do the work of 120 pounds of anthracite coal burned in the ordinary stove or range and to do it in a more wholesome and appetizing manner. The patents on this apparatus have been dedicated to public use.

OVEN BIRDS, birds belonging to the subfamily *Furnarinæ*, in the family *Dendrocolaptidæ* (tree-creepers). The oven-birds are found in tropical America and Argentina and are all of small size and feed upon seeds, fruits and insects. They walk on the ground with great ease. Some of these forms appear to frequent the shore, where they feed upon small mollusks and crabs. They are said to be exceedingly tame: the best-known species (*Furnarius fuliginosus*) haunting village gardens and seeming to court the company of man. Their popular name is derived from the form of the nest which they construct. It is built of straws and dried leaves mixed with clay and resembles an oven in its conical shape, being about eight inches in diameter. The walls are about an inch thick. The aperture exists at the side and the interior is divided by a partition-wall into two rooms, in the inner of which the eggs are deposited. The nest is placed on a high and generally exposed site. Other species make strange nests of various kinds, one being a massive cylinder of mud.

In the United States the name oven-bird is commonly given to the golden-crowned water-thrush, a small terrestrial warbler, which builds a covered nest on the ground in the woods. See WATER-THRUSH.

OVENSHINE, Samuel, military officer: b. Pennsylvania, 2 April 1843. He entered the Union army at the outbreak of the Civil War in 1861 and was commissioned 2d lieutenant, rising to the rank of captain in 1864. He continued in the army after the close of the War and in 1898 was appointed brigadier-general of volunteers and in 1899 was made brigadier-general of regulars and in the same year commanded a brigade in the Philippine Islands. He retired after over 30 years' active service.

OVERBECK, ō'vĕr-bĕk, **Johann Friedrich**, German painter: b. Lübeck, 4 July 1789; d. Rome, 12 Nov. 1869. He became very early imbued with the spirit of romanticism (q.v.) and on commencing his art studies at Vienna 1806, found at the Academy congenial friends in Pforr, Vogel and others of the same school. Their devotion to the old Flemish and Italian masters met with much criticism and opposition in the Academy and in 1810 Overbeck who was called by his father «the young German Raphael,» left for Rome where he associated himself with Schadow in the development of their common ideals. In the following year Cornelius joined their company and a little later Philip Veit and J. Schorr united with them in the formation of an artistic brotherhood. Their headquarters was the studio in the monastery of Saint Isidore, and they professed their object to be the religious and moral in art. Their aim was the revival of German art on the lines quatrocentists of Italy. They were first known as the Monastic Brotherhood of Saint Isidore and later as Nazarenes (q.v.), of whom Overbeck was the acknowledged leader. The first important work which they executed was the history of Joseph in the 'Casa Zuccara' near the Trinità de'Monti, then occupied by Consul-General Bartholdy. Overbeck painted there the 'Selling of Joseph' (1816), the cartoon for which is now in the city museum at Frankfort. He also contributed 'The Seven Lean Years' (1851). Five of the frescoes illustrating Tasso's 'Jerusalem Delivered' in the villa of the Marchioness Massimi are also his work. He decorated with frescoes the church of Santa Maria at Assisi, and among his numerous oil paintings examples are to be found in Saint Martin's Church, Lübeck, the New Picture Gallery at Munich and the Berlin National Gallery. The last remarkable pictures which he executed were the 'Coronation of the Virgin,' now in the City of Mexico; and 'Jesus Descending from the Hill of Nazareth,' in the museum of Antwerp. All his work is distinguished by refined drawing, noble composition and a profound spirit of devotion, and these characterize the 40 well-known designs illustrating New Testament history, all of which have been engraved, and some of them printed in colors. Among the founders of the German Romantic School of painting Overbeck is the only one who kept unfalteringly to the original program of the Nazarenes. His productions are of rare excellence in the perfection of the grouping, in directness and simplicity of expression and a purity of outline which recalls Perugina and the earlier style of Raphael. A sincere religious spirit pervades every conception, and the corporeal is dominated by the spiritual in all his refined ascetic forms and faces. It would seem that his love of the ecclesiastical and monastic type of character, and his enthusiasm for mediævalism, had much influence in his conversion to the Roman Catholic Church (1813). He exercised great influence as professor in the Academy of San Luca at Rome, and his most noted pupils were S. Steinle and

Führich. Consult 'Lives' by Atkinson and by Howitt; Dohmes, 'Kunst und Künstler des 19. Jahrhunderts' (1883–95).

OVERBURY, ō'vėr-bĕr-ĭ, **Sir Thomas,** English author: b. Ilmington parish, Warwickshire, 1581; d. London, 15 Sept. 1613. He was graduated at Queen's College, Oxford, and was called to the bar of the Middle Temple, and was knighted in 1608. He became adviser to the Earl of Rochester, then Robert Carr, at the court of James I, and provoked the anger of the Countess of Essex by endeavoring to dissuade his friend from marrying her. Rochester had the address to procure the imprisonment of Overbury in the Tower of London, where he was slowly poisoned by secret agents and at the end of the year Rochester married the countess. Three years later it became apparent that there had been foul play in Overbury's death: four subsidiary agents were condemned and executed, but Carr (then Earl of Somerset) and Lady Essex, though convicted and imprisoned until 1621, were finally pardoned. Overbury was highly cultured and was credited by Jonson with the introduction into court circles of intelligent appreciation of literature and art. His best remembered work is his 'Characters,' published as an appendix to his poem 'A Wife' (1614). Selections from 'Characters' were issued in *The Cornhill Booklet* for August 1901. His works were edited by Rimbault in 1856.

OVERCOMERS, a name commonly applied to a religious society originating in Chicago in the latter part of the 19th century, but now dwelling at Jerusalem, where they style themselves the "American Colony in Jerusalem." They have all property in common and have abolished among themselves the institution of marriage. They profess to have discovered the true interpretation of the Bible, by which all nations are to be brought into liberty, righteousness and love.

OVERFLOW BUG, the carabid beetle (*Platynus maculicollis*), common in California. At times its numbers increase at such a rate that it becomes a nuisance, but it is very beneficial as it destroys several species more nefarious.

OVERLAND ROUTE, a popular term applied to the route to California as distinguished from the route via the Isthmus of Panama. Also a term first used for the route from Europe to India via Egypt, the desert and Suez. It was in contradistinction to the Cape route which was by water only. It became more applicable in 1837, when the route was across the European continent by Marseilles; in 1845, when that by Trieste followed; and in 1872, when that via the Mount Cenis tunnel and Brindisi came into use. It also came into use in 1899 for the land route from Victoria, B. C., to the Alaskan gold fields.

OVERLAP. See Unconformity with Overlap.

OVERMAN, Lee Slater, American legislator: b. Salisbury, N. C., 1854. In 1874 he was graduated at Trinity College, North Carolina; was for some time employed as a teacher; and was private secretary to governors Vance and Jarvis. In 1878 he was admitted to the bar and began his law practice at Salisbury. He was elected to the lower house of the North Carolina legislature in 1883, 1887, 1893 and 1900, and was chosen speaker in 1893. He was president of the State Democratic Convention in 1900 and in 1903 was elected to the United States Senate. Senator Overman was re-elected in 1909 and 1914; became chairman of the Rules Committee in 1913 and was also active as a member of the Judiciary Committee.

OVERSEAS NEWS SERVICE, a German news association which, in 1917, was purchased by a syndicate representing the German government and partially merged with the Wolff Bureau, which had also come under the control of the government. See Press Associations and Wolff Agency.

OVERSEERS OF THE POOR, in the United States, are county officers whose duty is to make provision for the maintenance of the poor of the county. In New York and a few other States this duty devolves upon the county supervisors. In Great Britain overseers are public officers appointed annually in every urban district for the purpose of raising by rate on the inhabitants the sums necessary for the relief of the poor, and applying such sums to their relief. They have been appointed since the time of Queen Elizabeth by the important poor law act then passed. Their appointment must take place on the 25th of March, or within a fortnight thereafter. In urban districts the justices make the appointments, unless the local government board transfers it to the local council. In London the councils of the metropolitan boroughs act as overseers. Peers, members of Parliament, clergymen, barristers, attorneys, doctors, military and naval officers and others whose avocations require continual personal attendance are exempt from serving the office. All who are not exempted by some statute and even women are liable to be appointed, and it is an indictable misdemeanor to refuse without good cause to serve when duly appointed. The office is gratuitous, and no person is to be appointed overseer who is directly or indirectly concerned in any contract for the supply of any goods, materials or provisions for the workhouse or for the relief of the poor of the district.

OVERSKOU, Thomas, Danish dramatist: b. Copenhagen, 11 Oct. 1798; d. 1873. When only 20 years of age he had become possessed of some dramatic talent and began to play minor parts. In 1842 he retired with a pension; in 1849 he became manager under Herberg, whom he succeeded in 1856, but in 1858 retired. His first play, '1826,' written in 1826, was a pronounced failure, but his other dramas were of considerable merit and were successfully staged. The most noteworthy of these were 'Oestergade og Vestergade' and 'Capriciosa.' He also published 'Den danske Skueplads, i dens Historie, fra dens Begyndelse til vor Tid' (History of the Danish Theatre, 7 vols., 1854–76). His original comedies were published in five volumes (1851–52).

OVERSTONE, Samuel Jones Loyd, Baron, English financier: b. London, England, 25 Sept. 1796; d. there, 17 Nov. 1883. He was graduated from Cambridge in 1818, entered the banking-house of his father (who had been a Welsh dissenting minister) and became its head before its consolidation with the London and Westminster Bank. He was a member of Parliament for Hythe in 1819-26 and became a recognized authority on questions of finance. He strenuously opposed the introduction of limited liability and greatly aided in defeating the proposal for a decimal currency, but did not engage in politics after 1833, when he was defeated as candidate to Parliament for Manchester. He was the author of many valuable tracts on questions of finance, and the Bank Act of 1844 was directly due to the influence of his writings. In 1850 he was created Baron Overstone and Fotheringhay.

OVERT, *in law,* evident, undisguised; an overt act signifies an act which may be clearly proved and was manifestly intended. The mere contemplation of or intention to commit a crime is not an act amenable to human laws; but the moment an overt act is manifest the person so acting is amenable to the laws. In the United States two witnesses must bear testimony to the same overt act or a confession be made in open court in order to secure conviction.

OVERTHRUST. See FAULT.

OVERTON, James Bertram, American plant physiologist: b. Richmond, Mich., 23 Dec. 1869. He was graduated at the University of Michigan in 1894 and in 1901 took the degree of D.Ph. at the University of Chicago. In 1894-95 he was assistant principal of the high school at Black River Falls, Wis., in 1894-95 senior master in mathematics at Saint John's Military Academy, Delafield, Wis., in 1895-98 and in 1901 assistant in botany at the University of Chicago. From 1901 to 1904 Mr. Overton was professor of biology at Illinois College; in 1904-07 was instructor in botany; in 1907-12 assistant professor; in 1912-15 associate professor of plant physiology, and after 1915 professor at the University of Wisconsin. He is member of several scientific societies, American and foreign.

OVERTON, John Henry, English Anglican Church historian: b. Louth, Lincolnshire, 4 Jan. 1835; d. Gumley, Lincolnshire, 17 Sept. 1903. He was educated at Lincoln College, Oxford, took orders in the English Church and was curate of Quedgeley 1858-60; vicar of Legbourne 1860-83; rector of Epworth 1883-99; and rector of Gumley from 1898. He became canon of Lincoln Cathedral in 1879; canon of Peterborough in 1903, and was Birkeck lecturer on ecclesiastical history at Trinity College, Cambridge, 1902-03. He was the author of 'The English Church in the 18th Century' with C. J. Abbey; 'William Law: Non-juror and Mystic'; 'Life in the English Church 1660-1714'; 'Life of Christopher Wordsworth, Bishop of Lincoln'; 'Evangelical Revival in the 18th Century'; 'John Wesley'; 'The English Church in the 19th Century 1880-1833'; 'The Anglican Revival'; 'The Nonjurors'; and (posthumously) 'Some Post-Reformation Saints'; and 'History of the English Church from the Accession of George I to the End of the 18th century.'

OVERTON, Richard, a British pamphleteer flourishing in the first half of the 17th century, probably from about 1630-65. He spent part of his early life in Holland, but upon his return about the time when the Long Parliament opened commenced publishing anonymous attacks on the bishops. He next turned to theology and wrote a tract on 'Man's Mortality,' which excited much comment, and soon following the publication of this tract a small sect arose known as "Soul Sleepers," who adopted a modified form of his doctrines as portrayed in this tract. This was suppressed by the House of Commons and Overton branded a heretic. He then began a violent attack on the clergy in a series of pamphlets for which he was arrested, but his authorship could not be proven and the charge against him dropped. In 1646 he became involved with Lilburne in his case against the Lords and was imprisoned, but found support in the army and after a year of confinement was released. His imprisonment had not diminished his democratic zeal, for he at once took up with the London levelers and was one of those who presented to Fairfax the 'Plea for Common Right and Freedom.' On 28 March 1649 he was again arrested and sent to the Tower, and even while there managed to issue a 'Defiance' to the government, but through lack of sufficient evidence he was released on 8 November. In 1655 he became implicated in the projected uprising of the levelers, fled to France, obtained a commission from Charles II, and some months later returned to England to bring about an insurrection. Of his later history little is known except that he was imprisoned in December 1659 and again on 22 Oct. 1663, probably for attacks on the government of Charles II. The most important of his numerous works are 'New Lambeth Fair Newly Consecrated, etc.' (1642); 'Articles of High Treason Exhibited Against Cheapside Cross' (1642); 'Man's Mortality' (1643); 'The Arraignment of Mr. Persecution' (1645); 'An Alarum to the House of Lords' (1646); 'The Outcries of the Oppressed Commons' (1647); 'A Picture of the Council of State' (1649); 'Overton's Defiance of Act of Pardon' (1649); 'The Baiting of the Great Bull of Bashan' (1649), etc.

OVERTURE, *in music,* an introductory symphony, chiefly used to precede great musical compositions, as oratorios and operas. The Germans have composed overtures for poetical works, as Beethoven's overture to Goethe's 'Egmont.' Overtures are often played independently of the work for which they were written, as at the beginning of concerts; but their highest office is to convey to the intelligent lover of music the whole character of the following piece or to concentrate its chief musical ideas so as to give a sort of outline of it in instrumental music. The latter mode of composing overtures was first conceived by the French, and such is the character of the overtures of their great composers, among whom may be classed Cherubini. Carl Maria von Weber, in the overtures to the 'Freischütz' and 'Oberon,' in which the general character of the following piece is given, has observed this rule, which did not exist when Mozart composed his admirable overtures to 'Figaro' and 'Don Juan.' In the oldest overtures the fugue was the chief part, preceded by a *grave* and closing in the dominant. Another form came into vogue at a later period — three musical parts, in different movements — an *allegro,* an *andante* and again an *allegro* or *presto,* were united. At present the most usual form is a brilliant and passionate *allegro*, preceded by a short, solemn passage. See also PRELUDE.

OVID, Publius Ovidius Naso, Roman poet: b. Sulmo (Sulmona), high among the Apennines, almost due east of Rome, 20 March 43 B.C.; d. Tomi (Kustendje), on the Black Sea, south of the mouth of the Danube, 17 or 18 A.D. His family belonged to the class of wealthy landowners, and he and his brother, who died, however, in early manhood, were educated, as was usual, for an official career. In the short sketch of his life given in ‘Tristia,’ iv, 10, he tells us that, despite his best efforts, all that he wrote took metrical form, and although, to please his father, he persevered and actually filled several minor offices, poetry soon claimed him for her own. Twice married and soon divorced, he took as his third wife a lady of the great Fabian house, who remained faithful to him in his exile, though neither she nor his daughter shared it with him. His own gifted and winning personality, coupled with an ungrudging admiration of the genius of others, won for him the friendship of all the poets of his time, especially of Propertius, and of Tibullus, whose untimely death he laments in one of his few poems of true pathos (‘Amores,’ iii, 9). With the poet Æmilius Macer, Virgil's friend, he spent more than a year abroad, visiting Athens, the famous coast towns of Asia Minor, and especially Sicily, by whose beautiful scenery and legendary associations he was completely captivated. His works show the influence of his travels, though most of the material is supplied by his multifarious reading.

During the reign of Augustus, Rome became for the first time a really imperial city, and the external splendor of the capital was matched by the distinction of its fashionable society. All the arts of life were called into play to lend a finer polish and a keener zest to social intercourse. Wit and good manners took the place of religion and morality. Of this gay and cultivated society, with its worship of the senses, its cynical worldly wisdom and its love of brilliant rhetoric, Ovid is a typical member. In the first period of his literary activity he treats almost exclusively of love, regarded always as desire, never, at least on the part of the man, as devotion. To this time belong: (1) ‘Amores,’ in three books, poems for the most part associated with a certain Corinna. (2) ‘Heroides,’ 21 love letters written by women of the Heroic Age. The first 15 are to their husbands or lovers. The last six — Paris to Helen, Leander to Hero, Acontius to Cydippe and the replies in each case — are now regarded as probably Ovidian though their authorship has long been a matter of dispute. (3) ‘De Medicamine Faciei,’ on the beautifying of the face. (4) ‘Ars Amatoria,’ in three books, regarded by Macaulay as Ovid's greatest and most characteristic work. “Perhaps the most immoral poem ever written.” (5) ‘Remedia Amoris,’ a companion to the ‘Ars,’ but in no way comparable with it. He wrote also a tragedy, ‘Medea,’ much praised by ancient critics, which has not come down to us.

About the beginning of the Christian era he undertook the composition of two works of far wider scope and somewhat different character, the ‘Metamorphoses’ and the ‘Fasti.’ The first of these, in 15 books, is deservedly his best-known work. The stories of the Greek mythology, involving an amazing variety of transformations from primæval chaos to the change of Julius Cæsar into a star, are retold with inimitable grace and liveliness, and most ingeniously linked together, like the tales of ‘The Arabian Nights,’ into an unbroken series. The book has had an immense influence upon modern literature in England notably on Marlowe, Spenser, Shakespeare, Milton and Dryden, and was a storehouse of subjects for the painters of the Renaissance. The ‘Fasti,’ originally in 12 books, of which, however, the last six were never completed and published, is an account of the astronomical phenomena and the Roman festivals of the first six months of the year. The inquiry into the origin of the feasts and their ceremonies gives occasion for some entertaining stories from Roman mythology and early history.

Ovid was still engaged upon these works when, toward the end of the year 8 A.D., an imperial edict ordered him to leave Rome on a specified day and proceed to Tomi, on the desolate shores of the Euxine. His books were excluded from the three public libraries of Rome, and, while his property was not confiscated, no hope of recall was held out. The reason for his banishment is still a mystery. In the poems of exile, Ovid repeatedly ascribes his fate to two causes, his poetry (*carmen*) especially the ‘Ars Amatoria,’ and a “mistake” (*error*) not “guilt” (*scelus*), for which his eyes were responsible. But he steadily refuses to state the nature of this *error*, on the ground that he is unwilling to pain Augustus a second time. The ‘Art of Love,’ which had been published nearly 10 years before, while it may well have been the ultimate cause, could hardly have been the actual occasion of the edict, and it has been thought not improbable that he was involved in the intrigue of the younger Julia, the emperor's granddaughter, with Silanus, a scandal which was coincident with Ovid's ruin. He wrote at Tomi ‘Ibis,’ a learned invective against an enemy at Rome, and a fragment of a poem on fish, ‘Halieutica,’ also eulogies of Augustus and Tiberius which have not come down to us. The loss of the poem on Augustus is especially to be regretted, as it was written in the native Getic dialect. But the two important productions of these melancholy years are the five books of ‘Tristia’ and the four books of ‘Epistulæ ex Ponto.’ These elegies are addressed to his wife, to his friends, to Augustus, and give expression to the poignant sorrows of his present lot and his passionate longing for home. Boissier calls his appeals to Augustus a “delire d'adulation.” But it was all in vain, and he died a few years after the accession of Tiberius, broken hearted, though much beloved by the people of Tomi.

Ovid's work is characterized by remarkable smoothness and variety of expression, by the liveliest fancy, and a positive genius for graphic description, but he wrote with too great facility to learn the lesson of self-restraint. Nevertheless he is an incomparable story teller, and would to-day be famous for his mastery of the technic of the short story. With the exception of the ‘Metamorphoses’ and the ‘Halieutica’ which are written in hexameters, all his poetry is cast in the form of the elegiac distich, and this he brought to such perfection that the Ovidian couplet became the model for all modern work in this measure. See METAMORPHOSES.

Bibliography.— The best text is that of Merkel, revised by Ehwald (Leipzig 1889–94). The 'Amores' were translated into English verse by Christopher Marlowe and (in part) by Dryden, the 'Ars Amatoria' (in part) by Congreve and by Dryden, the 'Heroides' (in part) by Dryden, Book I of the 'Tristia' by Arden (New York 1821), Palmer's edition of the 'Heroides' with the Greek translation and commentary of Planudes was, issued in 1898. Garth gathered into one volume (1st ed., London 1810) versions of the 'Metamorphoses' by various hands, Dryden, Addison, Congreve, Pope, Rowe, Gay and others, including himself. Golding's famous translation first published 1567, was reprinted in London 1904. Two excellent translations have recently appeared in the Loeb Classical Library, 'Heroides and Amores' by Showerman (New York 1914) and 'Metamorphoses' by Miller (2 vols., 1916). Consult Nageotte, 'Ovide, sa vie, ses œuvres' (Dijon 1872); Sellar, 'Horace and the Elegiac Poets' (Oxford 1892); Boissier, 'L'Opposition sous les Cesars' (Paris 1892); Lafaye, 'Les Métamorphoses d'Ovide et leur modèles grecs' (Paris 1904); Butler, 'Post-Augustan Poetry' (Oxford 1909); Rand, 'Ovid and the Spirit of Metamorphosis' (in 'Harvard Essays on Classical Subjects,' Boston 1912).

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OVIEDO, ō-vē-ā'thō, **Juan Antonio,** South American clergyman: b. New Granada, 25 June 1670; d. Mexico City, 2 April 1757. He was graduated from the University of Guatemala and shortly afterward became professor of philosophy there; then for some time taught philosophy in Mexico and theology in Guatemala; became procurator at Rome and Madrid; then was appointed rector of Mexico and was twice provincial of the Jesuits of Mexico. His writings are mainly historico-religious, dealing mostly with the ecclesiastical history of Mexico and California.

OVIEDO, Spain, (1) a town in the Asturias, capital of a province of the same name, 230 miles northwest of Madrid. It is walled, and has clean but irregular streets. The Gothic cathedral (a part of which dates from the 9th century), university with 900 students, meteorological observatory, courthouse and hospital are the chief buildings. There are manufactures of firearms, explosives and ordnance. In 1809 Oviedo was given up to pillage for three days by Ney. Pop. about 53,269. (2) The province, area, 4,205 square miles, is situated on the Bay of Biscay, and bounded by the provinces of Santander, Leon and Lugo. It has a wild and stormy coast, and a mountainous interior better adapted for pasture than agriculture. Great numbers of cattle, goats and swine are raised and its horses are celebrated; linens, woolens, leather, etc., are manufactured, and coal is exported. Pop. 706,816.

OVIEDO Y VALDEZ, ē väl-dāth', **Gonzalo Fernandez de,** Spanish historian: b. Madrid, 1478; d. Valadolid, 1557. In 1513 he received a government appointment in the newly-discovered island of Hispaniola, and with few intervals spent the rest of his life there. Named by Charles V historiographer of the Indies, he wrote his 'Sumario de la Historia General y Natural de las Indias Occidentales' (1535 et seq. in 21 volumes). He wrote also 'Quinquagenas,' so entitled from its consisting of 50 dialogues, in which the author is the chief interlocutor, and fragmentary chronicles of Ferdinand and Isabel and Charles V. Much other work of his is still in manuscript.

OVIPAROUS ANIMALS are those that produce their young by eggs hatched after exclusion from the body of the parent, the development of the embryo thus not taking place within the parent's body. Except the mammalia, all animals are either oviparous or ovoviviparous; the latter mode — not essentially different from the former — being comparatively rare. Even those invertebrate animals which multiply by gemmation and division have also a true reproduction by *ova.*

OVIPOSITOR, an organ developed in relation to the orifice of the genital ducts of female insects, whose normal function is to place the fertilized egg in a position most suitable to its proper development. When typically developed the ovipositor consists of three pairs of stiff or membranous unjointed styles or gonapophyses, of which the anterior or lowermost closely ensheathes the other two. The three pairs together form a tube into the base of which the oviduct opens and along which the eggs are conducted to the situation selected for their deposition. The homology of these styles is not fully settled, but the generally accepted and best supported view is that they represent the embryonic appendages of the seventh, eighth and ninth abdominal segments, from which they are directly developed in at least some cases. In the entire orders of *Lepidoptera, Coleoptera* and *Diptera,* as well as in many representatives of other orders, no true ovipositor is developed. In such cases the terminal segments of the abdomen may form a retractile and protractile tube serving as an egg-conductor. The *Orthoptera, Odonata, Hymenoptera* and *Hemiptera* exhibit the organ in its highest state of development, and variously modified to meet various conditions. In the locusts it has the form of a stout sickle-blade, permanently exserted, and efficient in splitting plant tissues for the reception of the eggs. The sawflies have the margin of the outer sheath serrated for cutting slits into leaves, etc., while the cicades completely shatter twigs by the power of their ovipositors. Some of the ichneumon flies (q.v.) have ovipositors remarkably adapted to their parasitic habits; in the long-tailed ichneumon-fly, for example, the organ is filamentous and so long and powerful that it is capable of penetrating the solid wood of tree trunks to a depth of several inches, reaching and depositing eggs within the burrows of woodborers on which the ichneumon-fly larvæ subsist.

The most remarkable of all modifications of the ovipositor, however, is found among the ants, bees and wasps, in most of which it becomes a most efficient and beautifully constructed poisoning apparatus or sting, which consequently is possessed by the females alone. The sting, like other ovipositors, consists of three pairs of styles, but the middle pair are united into a single barbed piece grooved on the ventral side, and partly ensheathing the inner pair of very acute piercing darts. The outer pair form a protecting sheath to the sting proper. Within the abdomen is a tubular venom gland, with a reservoir and duct opening into the base of the grooved piece. When in operation the latter and the two darts work alternately in and out, penetrating deeper and deeper into the wound into which they conduct the venom. The male genital armature of insects is derived from essentially the same embryonic parts as the ovipositor and sting of the female, but never reaches the same structural complexity and serves solely as a clasping organ during copulation. Consult Packard, ‘Text-book of Entomology’ (1898).

OVIS, a genus of the family *Bovidæ* and subfamily *Ovinæ*, including the sheep (q.v.).

OVULE, an outgrowth of the carpel of a plant where, by fertilization with pollen, a seed is formed. It is the homologue of the macrosporangium of the pteridophytes (see Ferns and Fern Allies), and contains the embryo-sac or *macrospore*. The ovule consists of the *nucellus*, which is surrounded by one or two *integuments*, and is attached to the carpel by a stalk known as the *funiculus*, at a place called a *plasenta*. If the nucellus and funiculus are in a line, the ovule is *atropous;* if the nucellus is bent back on the funiculus it is *anatropous;* and if the nucellus is itself bent the ovule is *compylotropous*. The ovules are always enclosed among the angiosperms in the cavity of the ovary, or seed-producing organ. They are developed as a rule from the margin of the carpels, but several exceptional modes of development exist. The gymnosperms (q.v.) have no ovaries. See Seed.

OVUM, an egg. See Embryology; Egg.

OWARI, ō-wä'rē, or **BISHIU**, bē'shoo, Japan, a densely peopled province of the empire, on the island of Hondo, south of Mino, west of Mikawa, east of Omi and Isé. Owari Bay lies on its southern border. The soil is very fertile and the province produces vast quantities of clay suitable for all grades of pottery and chinaware. Seto, near the capital, Nagoya, was the original home of ceramic art in Japan, being introduced thither from China in the 13th century. Enameling is also an important industry of the province.

OWATONNA, ō-wạ-tŏn'nạ, Minn., city, county-seat of Steele County, on the Straight River and on the Chicago and North Western; Chicago, Rock Island and Pacific and the Chicago, Milwaukee and Saint Paul railroads; about 65 miles south of Saint Paul. It was settled in 1855 and incorporated in 1865. It is in an agricultural region in which corn, wheat and nursery stock are important products. The chief manufactures are dairy products, flour, foundry and machine-shop products, soap, butter tubs, churns, automobiles, carriages, seeders, engines and fanning mills. The prominent buildings are the courthouse, two opera-houses, city hospital, the church and school buildings. There are three parks, four steel bridges and a large number of fine residences. The educational institutions are the State School for Dependent and Neglected Children, the Pillsbury Academy, Sacred Heart Academy, public and parish schools and a public library which contains about 7,000 volumes. The government is vested in a mayor who holds office two years and a council. The city owns and operates the waterworks. Pop. 5,658.

OWEGO, ō-wē'gō, N. Y. («place where the valley opens»), village, county-seat of Tioga County, on the Susquehanna River at the mouth of the Owego Creek, and on the Delaware, Lackawanna and Western, the Lehigh Valley and the Erie railroads, about 30 miles east of Elmira and 20 miles west of Binghamton. It was settled in 1785 by James and Robert McMasters and others. It was chartered as a village in 1827. An Indian village, on the site of the present Owego, was destroyed by General Clinton in 1779. It is in a farming section, but has considerable manufacturing interests. It contains steel bridge works, mica works, leather glove factory, wagon works, cigar factory, saddlery, silk glove factory, piano factory and other manufacturing industries. Owego has considerable trade in lumber, farm products and in its own manufactures. The educational institutions are the Owego Free Academy, union and graded schools, one parish school and the Coburn Free Library. There are seven churches. The three banks have a capital of over $200,000; the annual business exceeds $800,000. The government is vested in a president and six trustees; three of the trustees are chosen each year by popular vote. It is also a favorite summer resort. There is a colored population of about 10 per cent of the whole. Pop. 4,633.

OWEN, ō'ĕn, **David Dale**, American geologist: b. New Lanark, Scotland, 24 June 1807; d. New Harmony, Ind., 13 Nov. 1860. He was educated at Hofwyl, Switzerland, and accompanied one of his brothers in 1827 to the United States, his father being the author of the socialistic undertaking at New Harmony. He made a special study of geology and natural science, and his investigations took him over a large portion of Indiana and Iowa. He made a government geological survey of Iowa, Wisconsin and Minnesota, beginning in 1848, and 1852–57 was engaged in a geological survey of Kentucky. He was appointed State geologist of Kansas in 1857–59. Among his publications are reports of his surveys of Indiana and Arkansas (1858–60).

OWEN, Sir **Douglas**, English barrister: b. 1850. He received a private education and also attended King's College School. He acquired an international reputation as an expert on maritime insurance and transportation; he has served on many government committees in connection with maritime affairs, and lectured at the London School of Economics and the Royal Naval War colleges. In 1914 he became chairman of the Advisory Committee of the State War Risks Insurance Office. He was knighted in 1915. His publications are ‘Digest of the Law of Marine Insurance’; ‘Declaration of War; a Survey of the Position of Belligerents and Neutrals in Maritime War’; ‘Ocean Trade and Shipping’; ‘London, the Port of the Empire’; ‘Ports and Docks.’

OWEN, **John**, English epigrammatist: b. Llanarmon, Wales, 1560; d. 1622. He received his education at Winchester School and at Oxford; became Fellow of New College in 1584 and in 1591–94 taught at Trelleck in Monmouthshire. He was made headmaster of the new free school at Warwick in 1594. Owen is but remembered for his Latin epigrams. Consult the collection 'Johannis Audoeni Epigrammatum Libri Tres' (1606) and the English translations of Hayman (1628); Harflete (1658); Peck (1659); Harvey (1678) and the French of Renouard (Paris 1794).

OWEN, John, English Non-Conformist clergyman: b. Stadhampton, Oxfordshire, England, 1616; d. Ealing, Middlesex, England, 24 Aug. 1683. He was educated at Oxford which he left rather than submit to Land's new statutes and early espoused the Parliamentary cause in the Civil War. In 1642–46 he was pastor at Fordham, Essex, from which he was ejected; and in the latter year took charge of a Presbyterian congregation at Coggeshall, Essex, and there introduced independent church government. He was appointed private chaplain to Cromwell in 1649, and in 1651 was dean of Christ Church, Oxford, where he was vice-chancellor of the university in 1652–57. Losing favor with Cromwell, he was removed from his office as dean in 1660, and though offered a parish in Boston, Mass., in 1663, and the presidency of Harvard College in 1670, declined both and was pastor of an independent church in London. In spite of the act of uniformity, he was tolerated and his preaching permitted. He devoted much time to literary work. He was a stout champion of the fullest religious liberty, and one of the most celebrated of Puritan. divines. His most notable work was an 'Exposition of the Epistle to the Hebrews' (1668–84). His collected works were published in Edinburgh in 1850–55 and in Philadelphia in 1865–69. Consult 'Life' by W. Orme (1820) and Moffatt, 'The Golden Book of John Owen' (1904).

OWEN, Mary Alicia, American author: b. Saint Joseph, Mo., 29 Jan. 1858. She was educated at private schools and at Vassar College and turned her attention to the study of Indian lore; her discoveries in Voodoo magic were important and she was admitted to tribal membership with the Indians and to their secret societies. She also made a study of the gypsies, and published 'Voodoo Tales'; 'Oracles and Witches'; 'Folk-Lore of the Musquakie Indians'; 'Prairie Tribes of the Algonquin Indians'; 'The Sacred Council Hills'; 'Rain Gods of the American Indians'; besides delivering many lectures on these subjects. She is president of the Missouri Folk-Lore Society and a distinguished member of other folklore and scientific societies.

OWEN, Sir Richard, English naturalist: b. Lancaster, 20 July 1804; d. Richmond Park, 18 Dec. 1892. He studied at the University of Edinburgh, began practice in London as a surgeon in 1826, became lecturer in comparative anatomy at Saint Bartholomew's Hospital in 1829, later was conservator of the Hunterian Museum of the Royal College of Surgeons until 1856, and in 1836–56 was first Hunterian professor of comparative anatomy and physiology. In 1838 he received the Wollaston gold medal of the Geological Society, and in 1840 became the first president of the Microscopical Society. From 1856 to 1883 he was superintendent of the natural history collections of the British Museum. In 1887 he obtained the removal of these collections from the museum and their establishment at South Kensington as a museum of natural history. He was the first Rede lecturer at Cambridge in 1859, and received numerous foreign distinctions, including the decorations of many orders and the Cuvier prize (1857). In 1857 he assisted David Livingstone (q.v.) in the preparation of the latter's 'Missionary Travels and Researches in South Africa,' and in 1861 published an edition of the posthumous papers of John Hunter. Among the more important of his own works were 'Odontography' (1840–45); 'Comparative Anatomy and Physiology of Invertebrates' (1843); 'British Fossil Mammals and Birds' (1846); 'On the Anatomy of Invertebrates' (1866–68); 'Fossil Remains of Extinct Mammals of Australia' (1877–8); 'Extinct Wingless Birds of New Zealand' (1879); and 'Experimental Physiology' (1892). By 1856 he had won recognition as the leading anatomist and palæontologist of his time. He was created K.C.B. in 1854. His scientific labors were extensive and continuous, and he was an active and often bitter controversialist. He was with Cuvier a pioneer in vertebrate palæontology, and made to the study many important contributions, including prominently a paper on 'Archæopteryx' (1863). His discoveries also were numerous. He was among the first to work toward a concise nomenclature in anatomy and to originate the theory of germ plasm. Consult 'Life' by his grandson (1894).

OWEN, Robert, English socialist: b. Newtown, Montgomeryshire, North Wales, 14 May 1771; d. there, 17 Nov. 1858. He established a small cotton-spinning works at Manchester, and later became known as a successful manager of large mills, and was the first to use Sea Island cotton. In 1794–95 he organized the Chorlton Twist Company, which operated the New Lanark mills, near the falls of Clyde, founded by his father-in-law, David Dale. There were 1,300 employees at the latter, nearly 500 being pauper children. As illustrating the thorough-going nature of the social experiment here made, in 1806, during the American embargo, the mills were stopped for four months, but the employees were paid full wages. In 1814 a new company was established to operate the mills, as the old partners were hostile to Owen's social schemes. This included the names of William Allen, Joseph Fox, Jeremy Bentham and other noted philanthropists and reformers, and was organized on the principle "that all profits beyond 5 per cent per annum on the capital invested shall be laid aside for the religious, educational and moral improvement of the workers and of the community at large." The employment of young children was stopped, a new system of education established, the houses improved and insurance funds established; and the community of New Lanark became noted for the prosperity of its people. In 1813 Owen published 'New Views of Society, or Essays upon the Formation of Human Character,' and in 1826–44 a 'Book of the New Moral World,' in which he advanced and developed his socialistic views, insisting upon an absolute equality among men. In 1817 he presented a report to a Parliamentary committee on the causes of poverty and means of avoiding it. In 1829 he gave up the management of the Lanark Mills, and devoted his time and entire fortune to the propagation of his socialistic doctrines. He set up two social communities on his own plan, one at Orbiston in Lanarkshire, another at New Harmony, Ind. (1824–28). They proved signal failures, the latter costing him $200,000. In his later years he became a believer in Spiritualism. He is regarded as the founder of infant schools and of Socialism in England; many of his followers were active in the Chartist movement. His chief conclusions were that there is something fundamentally wrong in all religions — a conclusion he first reached when 10 years old; and that "of all truths the most important is that the character of man is formed *for* and not *by* him."

Consult his own incomplete biography (1857–58); Holyoake, 'Life and Last Days of Robert Owen' (1871); Jones, 'Life, Times and Labours of Robert Owen' (1890); Podmore, 'Life of Owen' (1906).

OWEN, Robert Dale, American social reformer: b. Glasgow, Scotland, 9 Nov. 1801; d. Lake George, 17 June 1877. He came to the United States in 1824 with Robert Owen (q.v). In 1826 he received from Fanny Wright 860 acres of unimproved land at Nashoba, near Memphis, Tenn., for the purpose of establishing under white direction a settlement of liberated negroes. This scheme failed. In 1827 he established at New York with Fanny Wright *The Free Inquirer*, a socialistic, agnostic and Malthusian publication. In 1832 he returned to Indiana, where in 1835 he was elected to the legislature as a Democrat. He was chosen to Congress in 1843 and 1845. A measure concerning the Oregon boundary, introduced by him in 1844, became the basis of the settlement of 1846. He was prominent in the founding of the Smithsonian Institution (1845) and in the remodeling of the Indiana constitution (1850). In 1853 he was made *chargé d'affaires* at Naples, in 1855 Minister. After his return (1858) he was active as an abolitionist. He was, at least in later days, a firm believer in Spiritualism, and in this connection were written some of his most interesting works, such as, 'Footprints on the Boundary of Another World' (1859), and 'Debatable Land between this World and the Next' (1872). Others of his writings are 'The Personality of God and the Authority of the Bible' (1832), and 'Pocahontas: A Drama' (1837); 'Threading My Way' (1874), an autobiography covering the first 27 years of his career.

OWEN, Robert Latham, American lawyer and legislator: b. Lynchburg, Va., 6 Feb. 1856. Senator Owen began his career as a teacher in the Cherokee Orphan Asylum, but studied law and began practice in 1880. From 1881 to 1884 he was secretary of the board of education of the Cherokee Nation; and was owner and editor of the *Indian Chieftain* in 1884, and United States Indian Agent for the First Civilized Tribes, in 1885 to 1889. He organized the First National Bank of Muskogee, and was its president from 1890 to 1900, being also interested in banking, farming and cattle. He recovered from the United States government nearly $9,000,000 for Choctaws, Chicasaws and Cherokees. He was a member of the Democratic National Committee from 1892 to 1896. When Oklahoma was admitted to the Union Mr. Owen was elected United States senator from that State for the term 1907–13 and was re-elected in the latter year. He became chairman of the Committee on Banking and Currency in 1913, and was one of the framers of the Federal Reserve Act.

OWEN-GLASS CURRENCY BILL, better known as the Federal Reserve Act, was framed by Senator Robert Latham Owen of Oklahoma and Representative Carter Glass of Virginia in conjunction with Secretary of the Treasury McAdoo. The bill was introduced in both the Senate and the House on 27 June 1913. It passed the House 19 Sept. 1913, and the Senate, with amendments, 20 Dec. 1913; and was then sent to conference. It was thence reported with some changes back to the Congress, and was passed finally by the House 23 Dec. 1913, and by the Senate the following day; the President signing it immediately.

OWEN MEREDITH. See LYTTON, EDWARD ROBERT BULWER.

OWEN SOUND, Canada, town and county-seat of Gray County, Ontario, a port of entry at the mouth of Sydenham River, and at the head of its estuary (12 miles long) called Owen Sound, an outlet on Georgian Bay, Lake Huron. It is a terminal of branches of the Grand Trunk and Canadian Pacific railways, 122 miles northwest of Toronto, has one of the best harbors on the lakes, a dry dock, a large trade in grain and lumber and steamboat communication with all the principal lake ports. It has manufactures of agricultural and mill machinery, sewing machines, cement, bolts and screws and furniture, and lumber and flour mills, and large grain elevators. There are high and public schools and a library. Power is obtained from Eugenia Falls. Pop. 12,559. A United States consular agent is resident.

OWENS, ō'ĕnz, **John Edward**, American actor: b. Liverpool, England, 4 May 1824; d. near Towson, Md., 6 Dec. 1886. He made his first appearance as an actor in Philadelphia in 1841. In 1849 he was manager of the Baltimore Museum, and in 1852 opened Brougham's Lyceum in New York; later, manager of the Charles Street Theatre in Baltimore and afterward starred successfully for several seasons. In 1864–65 he played at Wallack's Theatre, New York, in 'Solon Shingle,' and in London. He starred in various stock companies and in 1882–83 made his last engagement in New York at Madison Square Theatre in 'Esmeralda.'

OWENS COLLEGE, Manchester, England, was established under the will of John Owens, a Manchester merchant, who died July 1846, and left about $500,000 for the purpose of founding an institution for providing or aiding the means of instructing youths over 14 years of age, in such branches of learning and science as are now or may be hereafter taught in the English universities, subject to the immutable condition that no student, professor, etc., shall be required to make any declaration or submit to any test of their religious opinions, and that theological and religious subjects shall form no part of the teaching of the college. From 1851 to 1873 the college occupied a private house, when it removed to a handsome Gothic building erected by public subscription. The success of the college led to a proposition, which received considerable ecclesiastical opposition, to incorporate a university, with several affiliated colleges located in different towns, but having its seat in Manchester. In 1880 Victoria University was instituted by royal charter, with power to grant degrees in arts, sciences and law, a supplemental charter, granted May 1883, giving power to grant degrees in medicine. Owens College was incorporated with Victoria University in 1904. University College, Liverpool, was incorporated with Victoria University from 1884 to 1903, and the Yorkshire College, Leeds, from 1887 to 1904. A women's college, under the direction of the professors of Owens College, is also affiliated, and Victoria University grants degrees or certificates to women. See MANCHESTER UNIVERSITY.

OWENS LAKE, a lake in Inyo County, southeastern California, east of Mount Whitney of the Sierra Nevadas, 18 miles long and 10 miles wide. It receives the waters of the Owens River (q.v.), but has no visible outlet, and its waters are very salt.

OWENS RIVER, a river of southeastern California, rises in the southern part of Mono County, flows southeast and then south, and empties into Owens Lake (q.v.); length, 175 miles. Its course is through a desert valley with the Sierra Nevada on the west and the Inyo Mountains on the east; its volume of water is considerably diminished during the summer season, some of its branches drying up entirely. A branch of the Southern Pacific Railroad parallels it for the greater part of its course.

OWENSBORO, ō'ĕnz-bŭr-ō, Ky., city and county-seat of Daviess County, on the Ohio River, and on the Illinois Central, the Louisville and Nashville and the Louisville, Henderson and Saint Louis railroads, about 41 miles southeast of Evansville, Ind. It has steamer connections with all the principal river ports. It is in a farming and stock-raising region, and near are forests, coal and oil fields. In the vicinity are deposits of iron, lead, zinc and fire clay, and stone quarries are nearby. The chief manufactures are tobacco products, alcohol, wagons, carriages, whisky, brandy, brick and tile and iron products. It has an extensive trade in tobacco products, coal, farm products, livestock and manufactures. The prominent public buildings are a government building, county courthouse, jail and the high school. Its educational institutions are Saint Francis Academy, public and parish schools. The mayor holds office four years. The waterworks and electric-light plant are owned and operated by the city. Pop. 18,500.

OWL CREEK MOUNTAINS, a small range of ridges of limestone, granite and schist forming a western extension of Bighorn Mountains in central Wyoming. They contain gold, copper, gypsum and phosphate. Consult report by N. H. Darton (published by 59th Congress, 1st Session, Doc. No. 219, 1906).

OWL PARROT. See KAKAPO.

OWLET MOTHS, a section of the family *Noctuidæ*, containing small species. The *Noctuidæ* is an immense assemblage of night-flying moths made up of hundreds of genera and thousands of species, and represented in all parts of the world. They are as a rule of less than medium size and of dusky tints, and are closely allied to the tiger-moths (*Arctidæ*), from which they may be distinguished by the subcostal nervure of the hind wing anastomosing with the radial only near the base of the cell. In the fore wing the fourth and fifth radial nervures fork from the third which is connected by a cross-nervule with the second. The frenulum is present and the first maxillæ are well developed. The caterpillars are not hairy as a rule, and 10 prolegs are usually present. The pupa is sometimes naked and subterranean, lying within a rude cell of clay; sometimes enclosed in a cocoon made partly of leaves, etc., on the surface of the ground.

OWLS, nocturnal birds of prey of the group *Striges*. The owls form a compact, clearly circumscribed group solidified by many common characters, but the question of their relationship to other birds is one which ornithologists have found most puzzling. Formerly they were united with the other birds-of-prey, but the raptorial bill and claws, in which the resemblance to the hawks is most striking, may well be only adaptations to similar predaceous habits. On the other hand it is equally probable that the soft plumage, highly developed sense-organs, etc., are adaptations to nocturnal activity. As a result of more fundamental anatomical studies systematists now agree in the close relationship of the owls to the night-jars and their kindred (*Caprimulgi*) as a suborder (*Striges*), in the order *Coraciiformes*. This suborder consists of a single family (*Strigidæ*), including all the owls of the world, and embracing two subfamilies and a great number of species. The very characteristic physiognomy of the owls results chiefly from the development about the eyes of areas of radiating feathers, or facial discs, supported by a ruff of peculiar stiff recurved feathers. Frequently the head is ornamented by paired tufts of longer, erectile feathers called horns or ears, though they have nothing whatever to do with the sense of hearing. The general plumage is very soft and fluffy, making noiseless flight possible and giving an exaggerated idea of bulk. The feathers have no aftershaft; and some species, like the snowy owl, have the feet and toes thickly feathered to the claws, giving them a peculiar booted appearance. The head is always remarkably large, and the bill strongly hooked and cered. A peculiarity of the large, strongly clawed feet is the versatility of the outer toe, which may be directed forward, outward or completely backward and paired with the hallux at will. In correlation with their keen perceptions the sense-organs are greatly developed. The great staring eyes look directly forward, and, owing to their form, can rotate but slightly in their sockets, a peculiarity which explains the owl's habit of following with the head any object at which its gaze is directed. The somewhat cylindrical or truncated conical form of the eye results from the great development of the bony sclerotic or focusing ring. Unlike most birds the upper, and not the lower lid is chiefly employed in closing the eye, which is further protected by a conspicuous nictitating membrane. Although many differences in the degree of its development are presented, owls are almost the only birds that may be said to have an external ear approaching that of mammals. It is concealed beneath the feathers, but, when best developed, as in the short-eared owl, covers the entire side of the head, and is provided with a prominent marginal fold of skin or «operculum.» In this case the openings are asymmetrical, one being directed upward, the other downward, and in the great gray owl and its immediate allies even the skull bones are asymmetrical. The barn owls are separated from all of the others as a subfamily *Striginæ*. They have the furculum complete and ankylosed with the sternum, and the latter with an entire posterior margin. The remaining owls (*Buboninæ*) have the furculum free from the sternum and either very thin or incomplete in the middle, and the posterior border of the sternum notched. Not less than 50 genera and 250 species of owls, varying in size from a sparrow nearly to a small eagle, have been described, and many exhibit several color-phases. The group is absolutely cosmopolitan.

Owing to their nocturnal habits, their ways are less well known than those of most birds, but in general are much alike. With the notable exception of such species as the snowy owl and hawk-owl, they seek concealment during the day in dark retreats, but become active after nightfall. Their prey consists of snails, insects, mice, birds, rabbits or even larger animals, according to the size of the species, which they approach on noiseless wing and usually grasp with one foot, after which it is borne away to a perch and torn to pieces. A few species feed on fishes, and one even on crabs, but none on vegetable matter. Undigested portions, as bones, hair and hard parts of insects are ejected in pellets from the mouth. Their voices present some variety; some hoot, some whistle, but the cry of many resembles a shrill laugh. Owls breed very early, many of them in late winter, and deposit their nearly spherical, white or whitish, eggs in holes in trees or rocks, in nests deserted by other birds or rudely constructed by themselves on the ground or in trees. One species, the American burrowing owl, nests in communities in or among the burrows of prairie-dogs, but the association does not assume the happy relation sometimes described. The young are interesting objects, thickly covered with down, usually white.

The mystery surrounding their nocturnal habits and their often lugubrious cries have made owls suitable objects of superstition among all peoples and in all ages. Among the ancients the owl was regarded on the one hand as a portent of dire calamity and its appearance near a sick chamber an omen of death; on the other, it was the bird of wisdom, the symbol of the goddess Athene. How deeply fixed and widely spread is the belief in the owl as an evil omen is shown by the frequency of its occurrence in all literatures and folklores. The Hindus have an interesting myth of the crow (night) and the owl (moon) contending for supremacy. Among the American Indians the owl figures in many legends. One told in the Kootenay tribe is to the effect that the wicked owl was in the habit of carrying off crying children. Through trickery it was finally killed and its body burned by the coyote, but its spirit rose from the ashes as a swarm of blood-sucking mosquitoes. See the names of various species as BARN OWL, etc.

For an account of the numerous species of owls of the United States consult Baird, Brewer and Ridgway, 'North American Land Birds' (1874); Newton, 'A Dictionary of Birds' (London 1896); Bendire, 'Life Histories of North American Birds,' Part I (Washington 1892), and works mentioned under BIRDS; and for ancient and mediæval superstitions Gubernatis, 'Zoological Mythology' (1872).

OWNERSHIP is the dominion of a thing real or personal, which one has the right to enjoy and to do with as he pleases, even to spoil or destroy it as far as law permits, except that he is prevented by some agreement or covenant restraining such right. An owner continues to have the same right although performing no acts of ownership, and although another may perform such acts without his knowledge or against his will; but an owner may lose his right in a thing if he permit it to remain in the possession of a third person for sufficient time to enable the latter to acquire a title thereto. Any thing or property may be the subject of a joint ownership by two or more persons having an equal right to it. Ownership as applied to one's title to property is the right by which a thing belongs to a particular person to the exclusion of all others. The foundation of ownership is possession, but it is not sufficient as against one who can show a better right. Ownership is divided into perfect and imperfect: it is perfect when it is perpetual and when the thing owned is unencumbered with any real right toward any other person than the owner; imperfect when it falls short of this.

OWOSSO, ō-wŏs'ō, Mich., city in Shiawassee County, on the Shiawassee River and on the Grand Trunk, Michigan Central and Ann Arbor railroads, about 80 miles west by north of Detroit and 30 miles north by east of Lansing. It was settled in 1836 by A. L. and B. O. Williams and Elia Comstock and chartered as a city in 1859. It is in a farming region and has considerable manufacturing interest. The chief industrial establishments are furniture factories, which have about 650 employees; casket factory, 250 employees; screen door and window factory, 250; car shops, 150; sugar works, 200; miscellaneous, about 200; and malleable iron products, 400 men. The prominent public buildings are the churches and schools. It has a business college, a Carnegie library, an armory and convention hall. There are eight churches. The three banks have a combined capital of $300,000. It has commission form of government with mayor and two commissioners. The waterworks are owned and operated by the municipality. Pop. 11,000.

OX, a bovine animal; that is, a ruminant of the sub-family *Bovinæ*, which includes the typical species of the large family *Bovidæ* (q.v.); more specifically, an adult castrated male of some domesticated breed. An uncastrated adult male is a «bull,» a female a «cow,» a young individual of either sex a «calf,» a yearling female a «heifer,» a young castrated male a «steer» and a bull castrated when mature a «stag.» The herd collectively is spoken of as «oxen» or «cattle.» Hence, by extension, all the *Bovinæ* are spoken of as cattle, wild or tame, a list of which follows. The group is characterized by its large size and bulky form and by various minor characteristics, of which the foremost is the roundness, smoothness, horizontal up-curving growth and comparative shortness of the horns. Like the other sections of the family, antelopes, sheep, goats, etc., oxen are easily recognized but rather difficult to define technically. The history of the group begins, so far as known, in the Lower Pliocene (Siwalik) formations of India. The oxen apparently originated in that part of the world and reached Europe and North America in the time represented by the Upper Pliocene rocks. In some of the earlier species the females seem to have been hornless; but the type quickly assumed its proper form and some of those fossil in the Siwalki beds are closely related to our modern domesticated cattle. Europe possessed in the Pleistocene, or period just preceding the Glacial Period, a widespread, gigantic long-horned species named *Bos primigenius* and another species (*B. brachycerus*) with much shorter horns. Both seem to have survived the Glacial Period in sufficient strength to reoccupy the continent after the recession of the ice; and they constituted the great forest oxen, which Cæsar found in his campaigns in Gaul and Germany and to which, not distinguishing them, he gave the general name *urus*. Some survived as late, at least, as the reign of Charlemagne, and from them were derived, no doubt, the modern domesticated races of the Western World, possibly with some small and later admixture of native Eastern species. These cattle were tall, strong and seem to have differed mainly in the comparative length and shape of the horns; and there seems no doubt that a remnant of *Bos primigenius*, nearly, or, as some believe, quite pure, exists in the white cattle preserved in the Chillingham estates in the north of England (see CHILLINGHAM WHITE CATTLE); it is also regarded as certain that the Holstein breed is a direct descendant of this species. The other (short-horned) species has long been extinct, but was apparently the progenitor of the great body of European domestic cattle, whence have been derived the herds of America, South Africa, Australia and, in fact, all the world except the Orient.

The domestication of cattle began in prehistoric times; and some Asiatic species now extinct may have supplied the stock represented as in the service of the civilized nations of ancient Persia, asia Minor, Syria and Egypt by the early carvings and paintings which have come down to us, but they may have been derived from one or both of the species above mentioned. They were carried to Carthage and westward and to southern Europe when the civilizations of Greece and the Italian Peninsula arose and some were no doubt gradually taken by Roman settlers into western Europe as fast as it was subjugated, where they would be crossed with the larger, hardier short-horned local races of Gaul. Apparently the native cattle of the British Isles were of the long-horned (*B. primigenius*) stock only; but when what now is England was conquered and colonized by the Romans and later by the Saxons, Normans, etc., the better short-horned cattle which they brought with them were substituted first in the south of England and gradually elsewhere, replacing the British long-horns everywhere except in the extreme north, where the red Highland cattle perhaps represent them to this day. The Friesian and Holstein breeds of the Netherlands and the semi-wild Spanish cattle are regarded also as nearly direct descendants of these aboriginal long-horned oxen and from the Spanish stock, transported to South and Central America in the 16th century, came the vast plains-ranging herds of the Argentine pampas, Mexico, Texas and neighboring States. It was not until comparatively recent times that care and improved methods of breeding began to develop in England, northern France and the Netherlands the improved breeds now so distinct and valuable for beef or for milking. Most of the early cattle brought to eastern North America seem to have been of the short-horned English variety; and these, keeping pace with European development by intelligent selection and the frequent importation of foreign sires of high quality and mingled with the western «scrub» cattle, have produced the excellent varieties now to be seen in the United States and Canada.

Nearest to our domestic cattle are two East Indian species, the gaur and the gayal (qq.v.), which are domesticated to some extent by the people west of the Bay of Bengal. Closely related is the banteng (q.v.) of Sumatra. The common humped or Brahman cattle (see ZEBU) of India and eastward represent a distinct species, of which no wild herds remain and which has been bred into many distinct varieties, of which one of the most aberrant is the Abyssinian sanga. The yak (q.v.) of Tibet and the diminutive forest-ox (see ANOA) of Celebes, bring the list of oxen down to the buffalos. Of these (see BUFFALO) the East Indian species still exists in wild bands in the jungles of India and the Malayan Peninsula, but has been domesticated for a very long period and is used as a beast of draft and of burden throughout southeastern Asia and in many parts of tropical Africa. Africa has two native species, neither in domestication. A fourth species inhabits Mindanao, one of the Philippine Islands. The bisons (q.v.), composed of the American bison and the aurochs, neither of which have been domesticated to any practical extent, both of which are extinct except in small protected herds, complete the list of the bovine animals of the world.

Consult standard zoologies, especially the writings of Blanford upon the mammals of India, Persia and Abyssinia; Lydekker, ‹Oxen, Sheep and Goats of the World› (1898); and the authors cited under BISON, BUFFALO, etc.

ERNEST INGERSOLL.

OX-BIRD, or OX-EYE. See DUNLIN.

OX-BOT, a bot-fly (q.v.) attacking meat cattle; a warble-fly. The well-known ox-bot or breeze-fly of Europe is *Hypoderma bovis*, and until about 1890 it was believed by naturalists that the very similar flies prevalent in North America were the same, but it is now known that they belong to a second species (*H. lineata*) locally known in the southwestern United States as heel-fly. The larvæ or warbles are called «grubs» by American stock-raisers, and affected cattle are said to be «grubby.» These and various allied species parasitic upon domestic and wild animals, and even upon humanity in certain tropical regions, constitute the family *Œstridæ*. In the case of the American ox-bot (*H. lineata*) the flies appear early in spring and haunt feeding cattle, hovering especially about their legs, where they deposit their eggs mainly upon the hairs overhanging the hoofs. The egg is barely visible to the unaided eye, is cigar-shaped and has one end formed into a clasping appendage by which it is attached to the hair. Five or six are placed in a close row on each hair. The cattle lick themselves and gather these eggs upon the tongue, where they hatch, and the maggots make their way into the gullet, where they catch on the walls, force their way through by means of the sharp spines about the head, and nest in the wall-tissues of the throat until they have undergone a molt. They remain here many weeks, then make their way to the skin of the neck and work along beneath it to the back, where during winter the presence is shown by the swelling of the hide over them. There is evidence that some of the larvæ, at any rate, bore their way into the skin instead of entering by the gullet. These grubs are nourished by the pus and serum produced about them by their movements. Some weeks later, or toward spring, the maggots reach maturity, molt again, become nearly an inch long and at last force their way out through the skin; they then drop to the ground, the larval skin dries and stiffens and the maggot within separates itself from this old integument and turns into a pupa stage, which is speedily completed, allowing the fly to emerge in time to produce a brood before the end of the summer. The knowledge of this life-history was gained only as recently as 1890, mainly through the investigations of Dr. Cooper Curtice; and it is not yet known whether the eggs and young of *H. bovis* pass through a similar series of events.

The damage done by ox-bots is very great, and is due to the perforation of hides by the escape of the maggots; loss of milk and beef due to the fretting and often stampeding of the cattle when the flies are laying their eggs; and general depreciation of the stock. The insect is so uncommon that it may be disregarded east of the Alleghanies; but it is exceedingly numerous and troublesome in the Mississippi Valley and Southwestern States, and the cattle there, especially in Texas, betray the greatest terror in the fly season, rushing headlong when a fly appears, and if possible dashing into the water and staying there. In addition to the harm to beef and milk caused by the nervousness, exhaustion and interference thus produced, one-half of the hides that reach market from the infested regions show perforation by warbles, and suffer a discount in price which on the average will amount to a third of the value of perfect hides. Consult Bauer, 'Monographie der Œstriden' (1863); Ealand, E. A., 'Insects and Man' (London 1915); Howard, 'The Insect Book' (1901); Osborn, 'Insects Affecting Domestic Animals' (United States Department of Agriculture, 1896).

OX-BOW LAKES. See MEANDERS.

OX-EYE, a popular name for several composite plants. In America the name is most widely applied to *Heliopsis*, three species of which are distributed from Nova Scotia to Florida and westward to Arizona. They are perennials which bear abundant yellow flowers in the fall, but are not so popular in gardens as members of the genus *Helianthus*, the sunflowers. The ox-eyes of Europe are a species of *Buphthalmum*, which are sometimes grown in America in hardy borders. They have large flower-heads with long yellow rays, and resemble sunflowers. Being showy and of simplest culture they are worthy a place in gardens. In the New England States the name is given to the black-eyed susan (*Rudbeckia hirta*), and to the ox-eye daisy (*Chrysanthemum leucanthemum*). See DAISY.

OX-GALL, the bile of the ox, a greenish bitter fluid secreted by the liver of the animal. After being clarified it is suitable for various uses in manufactures and the arts, especially in the mixing of colors for water-color painting, its effect being both to increase their fluidity and to fix them. Another employment is as a cleansing agent in scouring wool, etc. It is also used in medicine, either in concentrated mass or powdered after being dissolved in alcohol and rendered clear, as a stimulant to the flow of bile and as compensation for the lack of the secretion of bile. It is further useful in the form of enemas.

OX-PECKER. See BUFFALO-BIRD.

OX-WARBLE. See OX-BOT.

OXALIC ACID, a dibasic organic acid which takes its name from the occurrence of its acid potassium salt in common sorrel (*Oxalis acetosella*). The same salt is found in other plants, notably the garden rhubarb, and the free acid is found in the leaves of the sugar beet. Calcium oxalate is common in many varieties of lichens. Oxalic acid is commercially prepared by heating sawdust, preferably that of the soft woods, with caustic soda and caustic potash by hot air with the addition of steam. The temperature required is about 570° F. At a lower temperature a large proportion of acetic acid is formed. The immediate product is oxalate of soda, which may be obtained in granular form by digesting the mass with boiling water and evaporating the filtrate. To prepare the acid in the free state, the sodium oxalate is boiled with milk of lime, and the calcium salt so obtained is decomposed with sulphuric acid. The product thus obtained contains some oxalates, and to get rid of these the crude acid is dissolved in a 10 to 15 per cent dilution of hydrochloric acid, and crystallized. It is then melted and recrystallized to remove the hydrochloric acid. Anhydrous oxalic acid may be obtained in the form of octahedral crystals, by allowing a solution of oxalic acid in sulphuric acid to stand for some days. The anhydrous acid has the formula COOH.COOH, or $H_2C_2O_4$, sublimes at 355° F., forming white needle-like crystals, which gradually absorb water from the air, falling into powder. The oxalic acid of commerce contains two molecules of water, crystallizes in the monoclinic system and is readily soluble in water and in alcohol. The hydrated crystals give off their water of crystallization when heated to 212° F. or when allowed to stand for some weeks over concentrated sulphuric acid. Heated to about 300° F., oxalic acid decomposes with the formation of carbon monoxide, carbon dioxide, water and formic acid; a small quantity of oxalic acid also subliming at the same time, without change. When heated with concentrated sulphuric acid, it breaks up into water, carbon monoxide and carbon dioxide, the latter two gases being given off in equal volumes. Solutions of oxalic acid are decomposed in the presence of a bright light, yielding water and carbonic acid. This action may be measurably prevented or retarded by the addition of varying proportions of thymol. Oxalic acid forms two series of definite, crystallizable salts, according as one or both of its typical hydrogen atoms are replaced. The neutral oxalate of ammonia is used, in the laboratory, as a reagent for the detection of lime, since it gives, with a salt of calcium, an insoluble, white precipitate of calcium oxalate. Neutral oxalate of potassium reacts with ferrous sulphate to form a double oxalate of iron and potassium, which possesses powerful reducing properties, and is used as a photographic developer in wet plate processes. The acid oxalate of potassium (also known as salts of lemon, or salts of sorrel) is used for different purposes in the arts. Owing to its powerful oxidzing properties oxalic acid itself is used in calico-printing and in indigo dyeing as a «discharge.» It is a constituent of several important dyestuffs. It is used also in various bleaching processes, especially the bleaching of straw and flax, and in the whitening of leather. In domestic economy it is employed for cleaning and polishing articles of brass and copper, for cleaning woodwork, removing ink stains, etc. For these purposes the oxalate and quadroxalate of potassium are equally efficient.

Poisoning by Oxalic Acid.— There is reason to believe that poisoning sometimes results from the frequent use of some cheap effervescent drinks in which citric acid is adulterated with oxalic acid. The hydrated crystals bear a close resemblance to Epsom salts, and being sometimes mistaken for them lead to fatal poisoning. Carelessness in domestic use also may result in poisoning. Oxalic acid is ranked as a corrosive poison, though, if taken in dilute solution, there may be no evidence of corrosion. The symptoms of this poisoning are heat and severe pain in the mouth, throat and stomach, difficulty in swallowing, a sense of constriction, vomiting — perhaps of blood — muscular cramps, sometimes convulsions, and purging, in some cases attended with blood. The lips, mouth and throat are at first red and swollen, then white. If the poisoning is severe the pulse is small and thready, there is a cold, clammy perspiration, then collapse, and, it may be, death. For treatment, first neutralize the poison by giving milk of lime, with a large excess of slaked lime, chalk, whiting or even whitewash from the wall, if no other form of lime can be obtained; then give a purgative dose of castor-oil, allay pain, and give stimulants if signs of collapse be present. Emetics are rarely needed and any liquid other than milk of lime should be sparingly used, if at all.

OXALIC ACID FERMENTATION. Free oxalic acid is produced as the result of fermentation by the action of the mould *Aspergillus niger* upon a nutrient solution containing glucose, at a temperature of 60° to 70° F. The acidity increases progressively in the solution to a certain maximum, then gradually diminishes and eventually disappears. By the addition of calcium carbonate to the solution the oxalic acid may be fixed in the form of the insoluble calcium oxalate. About half of the glucose present is thus converted into oxalic acid, the remainder being consumed in the growth of the mould.

OXALIS, a genus of herbs and shrubs of the family *Oxalidaceæ*. The species, of which there are about 200, are mostly natives of the warm parts of South America and Africa, but some are well-known weeds, called wood-sorrel, in the north temperate zone; many have tuberous or bulbous roots. The genus is generally characterized by digitate or ternate compound, clover-like leaves which «sleep» at night or in very cloudy weather, that is, the leaflets assume a resting position at such times. The flowers generally close under similar conditions. The seeds, which are contained in a capsular fruit, are thrown to considerable distances when the fruit bursts open. The best-known American species is the common wood-sorrel (*O. acetosella*). It is also a native of Europe and western Asia. Naturally it grows best in shady places and is often found covering the ground as thickly as grass, its little white, rosy-veined flowers appearing in abundance throughout the season. Probably the next best known is the violet wood-sorrel (*O. violacea*), a native of the eastern United States. It inhabits similar localities but has pinkish violet flowers. The tuberous roots of some species are used for food in western South America.

OXALURIA, a morbid condition of the system, in which a prominent symptom is the presence of crystallized oxalate of lime in the urine. See URINE.

OXENBRIDGE, John, English colonial divine in America: b. Daventry, Northamptonshire, 30 Jan. 1608; d. Boston, Mass., 28 Dec. 1674. He was educated at Cambridge and Oxford, preached for a time in England and later in the Bermudas, whither he made two voyages, held a curacy at Beverley, was pastor of a church at Berwick-on-Tweed, held a fellowship at Eton from 1652 until ejected at the Restoration (1660), and as a preacher was driven from the exercise of his office by the Act of Uniformity. In 1669 he came to New England, and on 4 May 1670 was ordained pastor of the first church at Boston. In 1672 he was appointed a licensor of the press. Among his works are 'A Double Watchword' (1661); 'A Seasonable Proposition' (1670); 'A Sermon at the Anniversary Election of Governor' (1672).

OXENDEN, Ashton, British clergyman: b. Broome Park, 1808; d. 1892. He was educated at University College, London; was holder of the living of Pluckley, Kent, in 1849–69, becoming honorary canon of Canterbury in 1864. In 1869 Oxenden was made bishop of Montreal and primate and metropolitan of Canada. Ill health compelled his resignation in 1878, after which he ventured to England and was later vicar of Saint Stephen's, Canterbury. He published 'The Cottage Library' (6 vols., 1846–51); 'The Pathway of Safety' (1856); 'The Home Beyond' (1861); 'The Parables of Our Lord Explained' (1864); 'A

Plain History of the Christian Church' (1864); 'My First Year in Canada' (1871); 'A Simple Exposition of the Psalms' (1872); 'The Christian Life' (1877); 'Counsel to the Confirmed' (1878); 'Touchstones' (1884); 'Short Comments on the Gospel' (1885). Consult his autobiography (London 1891).

OXENFORD, ŏk'sĕn-fôrd, **John,** English dramatist and critic: b. Camberwell, London, 12 Aug. 1812; d. London, 21 Feb. 1877. He was educated for the law and admitted to the bar in 1833, but chose a literary career. He translated from the German several notable works, among them 'Conversations of Goethe.' For 30 years preceding his death he was dramatic critic on the London *Times*. Among his plays are 'My Fellow Clerk' (1835); 'The Two Orphans'; 'Twice Killed' (1835); 'A Day Well Spent.'

OXENHAM, ŏk'sĕn-ạm, **John,** English novelist. He was educated at Victoria University, Manchester, and was for some time resident in this country. Returning to England he gave up commercial pursuits and turned to literature. He has published 'God's Prisoner' (1898); 'Rising Fortunes' (1899); 'A Princess of Vascovy' (1900); 'Our Lady of Deliverance' (1901); 'A Modern Masquer' (1901); 'John of Gerisau' (1902); 'Under the Iron Flail' (1902); 'Bondman Free'; 'Mr. Joseph Scorer'; 'Barbe of Grand Bayou' (1903); 'A Weaver of Webs'; 'Hearts in Exile' (1904); 'The Gate of the Desert'; 'White Fire' (1905); 'Giant Circumstance' (1906); 'The Long Road' (1907); 'Pearl of Pearl Island' (1908); 'Great-Heart Gillian' (1909); 'Lawristons' (1910); 'Their High Adventure' (1911); 'Mary All-Alone' (1913); 'Bees in Amber' (verse); 'Broken Shackles' (1914); 'Everywoman and War' (1915). His war-time hymns and verse, such as 'For the Men at the Front,' 'All's Well,' 'The King's Highway' and 'The Vision Splendid,' struck deeply sympathetic chords and have attained great circulations.

OXENSTIERNA, ŏks'ĕn-shār-nā, **Axel,** Count, Swedish statesman: b. Fanö, 16 June 1583; d. Stockholm, 26 Aug. 1654. He studied theology and later law at Rostock, Wittenberg and Jena; at 20 entered the diplomatic service of Charles IX; was his Minister to Mecklenburg in 1606; entered the Senate in 1609; was head of the regency during the last days of Charles IX and through the minority of Gustavus Adolphus; became Chancellor of the Realm in 1612; acted as regent during the prolonged absence of the king; effected the Peace of Stolbova with Russia (1617); in 1626 was made governor-general of Prussia and in 1629 concluded the Peace of Altmart with Poland. After the death of Gustavus Adolphus at Lützen in 1632, Oxenstierna received almost unlimited powers, directed the Protestant league against Austria and held it together for four years. He returned to Sweden in 1636 and became the leading spirit in the regency of Christina, using all efforts to bring about peace with Germany. The Peace of Brömsebro, concluded in 1545 as the result of negotiations undertaken by his son John, the Swedish plenipotentiary to Germany, was highly displeasing to the queen. His obstinate opposition to Christina's plan of naming her own successor widened the breach between them, and he gradually withdrew from public affairs. He was, next to Cardinal Richelieu, the ablest diplomatist of his age. He founded a Swedish colony on the Delaware in 1638.

OXENSTIERNA, Johan Gabriel, Count, Swedish statesman: b. 1750; d. 1818. One of his masters was the critic, Olof Bergklint, after which Johan spent a year in the employ of the chancery and then was made secretary of legation at Vienna in 1770. After four years there he returned to become king's chamberlain, after which he held several high offices at court, and from 1792 to 1801 was marshal of the realm. In 1786 he became one of the first members of the Swedish Academy. He translated Milton and a part of Tasso into Swedish, but his literary fame rests in his poetic works, 'Skördarna' and 'Dagens Stunder.' His works appeared at Stockholm (5 vols., 1805–26). Consult Lamm, M., 'J. G. Oxenstierna, en gustaviansk natursvärmares lif och dikt' (Stockholm 1911).

OXFORD, ŏks'fŏrd, England, a celebrated university city and county borough, the capital of Oxfordshire, 54 miles northwest of London (63½ miles by rail), is situated on a low-lying bank at the confluence of the rivers Thames (locally called Isis) and Cherwell. The rivers are crossed by several bridges, the principal of which are Magdalen Bridge, over the Cherwell, and Folly Bridge, over the Isis. In early times the city was surrounded by a wall, a portion of which still exists, intact, in New College Gardens. The castle of Oxford, famous for the Empress Matilda's escape over the frozen Thames in 1141, has disappeared, but the keep, built in the time of Rufus, remains entire, and is included in the precincts of the prison. The principal street, colloquially "The High," has a length of about 1,000 yards, and its greatest width is 85 feet. It is adorned by several of the noblest structures of the city, including Brasenose, All Souls University, Queen's and Magdalen Colleges, Saint Mary's (the university church), the New Examination Schools, together with quaint old houses. The botanic gardens, dating from the 17th century, add to the beauty of the street.

Educational Institutions.— The most interesting buildings are the colleges, component parts of the University of Oxford (see Oxford, University of), but separate corporations, possessing property apart from the university. The buildings of the university proper are situated mainly between Broad and High streets. The most remarkable is the Bodleian Library, founded by Humphrey, Duke of Gloucester, built between 1444 and 1480, and restored by Sir Thomas Bodley about 1610. South of the Bodleian is the beautiful Radcliffe Camera (or Camera Bodleiana), erected 1737–49 to contain the books presented by Dr. Radcliffe to the university, but now used as a reading-room for the Bodleian. A new building for the Radcliffe Library has been erected in the precincts of the museum by the munificence of the Drapers' Company of London. North of the Bodleian stands the Clarendon Buildings, built from the proceeds of Clarendon's 'History of the Great Rebellion.' It was until 1830 the home of the Clarendon Press, but is now utilized for the various university offices. Westward of the library is the Sheldonian Theatre, designed by Wren, and presented by Archbishop Sheldon, a large semi-circular chamber, capable of seating 4,000 persons, and used by the university for the conferment of degrees and other public functions. The university also possesses the New Examination Schools, the Taylor Institution, with the University Galleries and Ashmolean Museum; the Science Museum, the large university parks with the beautiful walk known as Mesapotamia, the Indian Institute and the Botanic Gardens. New laboratories and a new building for the Radcliffe Library have been erected in close proximity to the Science Museum. The New Schools are used for university lectures as well as for examination purposes.

The most remarkable of the various college buildings is Christ Church. The great quadrangle (Tom Quad) is the largest in Oxford; the gateway was begun by Cardinal Wolsey, completed from designs by Wren, and contains the famous bell known as "Great Tom." Christ Church is also remarkable for its magnificent dining-hall and staircase and its library. The cathedral, situated in the college precincts, fulfills also the function of a college chapel. Not less interesting is Merton College, with its ancient chapel and the "Mob Quad," the earliest quadrangle in Oxford. New College, a perpendicular building of the late 14th century, is due to the munificence and to the architectural skill of the great prelate, William of Wykeham. Its chapel, cloister and gardens are among the sights of Oxford, and its large quadrangle remains, except for the addition of a third story, much as it appeared to the founder's eye. Magdalen College is famous for its exquisite tower, its chapel and cloisters and the water walks, known as Addison's Walk. The buildings of All Souls College are also rich in architectural association, and every college has some feature of peculiar interest. The chapel and garden buildings of Saint John's, the library of Corpus Christi, Dr. Johnson's rooms at Pembroke and the general effect of the quadrangles of Corpus Oriel, Wadham, Balliol and University are illustrations of this. Modern additions to the architecture of Oxford have not been uniformly fortunate, but the latest additions to Brasenose and New College and the Examination Schools are worthy of the traditions of the university. Several of the colleges, notably Worcester, Saint John's, Wadham, Merton, New College and Trinity, have also beautiful gardens, and Christ Church possesses the famous Broad Walk in the Meadow. There are several colleges for women, the most important of which are Somerville College, Lady Margaret Hall, Saint Hilda's Hall and Saint Hugh's Hall. Mansfield College (perhaps the most successful piece of recent building in Oxford), intended for the education of men for the Non-Conformist ministry, was established in 1889; and buildings were opened in 1893 for Manchester College, removed from London in 1889.

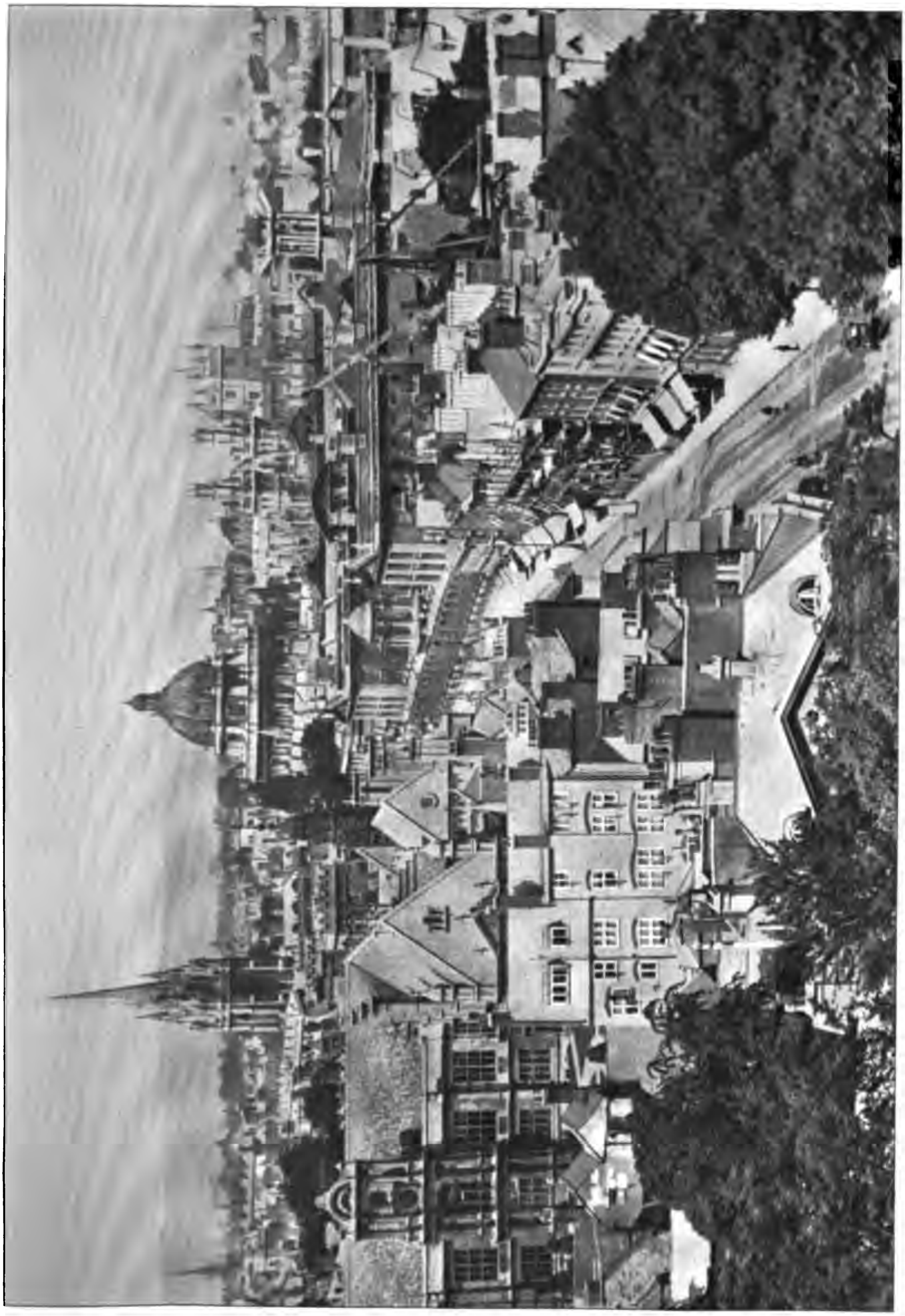
Libraries.— The Public Libraries Act was adopted in 1852 and a library opened two years later. The present building, forming part of the new town-hall, was opened in 1895, and contains lending and reference departments, general ladies' newspaper rooms, and a children's reading-room and library. The library contains over 25,000 volumes. Special features are a large collection of local books and a Braille library for blind students of the university.

Public Buildings and Charitable Institutions.— Notable buildings not connected with the university are the new municipal buildings containing the town-hall, public library, police station and court, and the various city offices, the Corn Exchange, numerous schools, the Radcliffe Infirmary, the Warneford Lunatic Asylum on Headington Hill, the Martyrs' Memorial, the Pusey Memorial House, with its Chapel of the Resurrection, and the New Theatre.

Churches.— Oxford is the see of a bishop. Christ Church, the cathedral church of the diocese, originally belonged to the priory of Saint Frideswide. Besides being the cathedral church of the diocese it is also the college chapel, but is of greater antiquity than the college, having been built in the 12th century. Saint Mary-the-Virgin, the university church, finely situated nearly in the centre of the High street, is conspicuous by its richly decorated tower, terminating in a beautiful spire 189 feet high. It ranks as one of the finest Gothic structures in Oxford. The church of Saint Martin's or Carfax was removed in 1896 to afford more room at the crossing of the four great thoroughfares, High street, Queen street, Cornmarket and Saint Aldate's. The ancient tower has been preserved. All Saint's Church is a Queen Anne building in the classic style, of which it is an excellent example. Saint Mary Magdalene presents several beautiful features, and has acquired much additional interest from the Martyrs' Aisle, added as a fit accompaniment to the Martyrs' Memorial, which stands close to it, near the spot where Ridley, Latimer and Cranmer suffered martyrdom. The most important of the other ecclesiastical edifices in Oxford are the churches of Saint Aldate, Saint Giles, Saint Peter in the East, Saint Thomas, Saint Barnabas, and the Roman Catholic church of Saint Aloysius. Saint Peter in the East is very ancient, and possesses Saxon as well as Norman work; it has a large crypt. Several handsome churches have been recently erected, Saint Philip and Saint James' and Saint Margaret's in the north; Saint Matthew's in the south and Saint Mary and Saint John's in the east, the last served by the Cowley Fathers, an active Anglican brotherhood. The city contains also places of worship for Methodists, Congregationalists, Baptists, Brethren and other non-conformist bodies. During the 19th century the city has been encircled by extensive residential surburbs. Less than two miles from Oxford stands, close to the river, the Norman church of Iffley, one of the most perfect pieces of Norman architecture in England.

Public Works, Government, etc.— The prosperity of the city depends mostly on the university, but a considerable trade is carried on in grain, and a cattle market is held twice a month. The city is governed by a council, consisting of a Mayor, 15 Aldermen and 45 councillors, of whom three aldermen and councillors are elected by the university. It returns one member to Parliament. Since 1892 the city has been lighted by electricity, it has a modern drainage system, an excellent water supply and municipally-owned tramways. Pop. about 53,048.

OXFORD, ENGLAND



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High Street, College Buildings, Saint Mary's Church and Bodleian Library

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J. Lockhart Dougan,
Chief Librarian, Public Library, Oxford.

OXFORD, Mass., town in Worcester County, situated on the New York, New Haven and Hartford Railroad, 10 miles south of Worcester. It contains an old Universalist church, a public library, woolen mills, shoe factories, etc. There are also many historic landmarks of the Huguenots, a colony of whom settled here. Pop. 3,470.

OXFORD, Miss., city and county-seat of Lafayette County, on the Illinois Central Railroad, 75 miles southeast of Memphis, Tenn. It is a cotton growing region and has a cotton gin and mill. It has two public schools, one for the colored race; it is the seat of the State University and in connection with its public schools affords a splendid educational centre. It was built in 1836, but was burned during the Civil War. Oxford is surrounded by farm lands well adapted to the raising of clover, corn, cotton, berries, fruits and vegetables. Pop. 2,014.

OXFORD, N. C., town, county-seat of Granville County, on a northern branch of the Tar River, and on the Southern Railroad, 42 miles north of Raleigh. It is in a fertile tobacco and cotton-growing region, has a large trade in tobacco and contains several tobacco warehouses and manufactories, also a saw-mill, furniture factory and an iron foundry. It has two orphan asylums, one for colored children, the other under the charge of the Masonic fraternity. It has no public high school, but is the seat of the Horner Military School (non-sectarian) and of the Oxford Female Seminary (Baptist, 1850), with secondary and collegiate departments, and Granville Test Farm. Pop. about 3,018.

OXFORD, Ohio, village in Butler County, on the Cincinnati, Hamilton and Dayton Railroad, about 35 miles north by west of Cincinnati. It is in an agricultural region and its chief industries are connected with farm products. It is noted as an educational centre; it is the seat of Miami University (q.v.), Oxford College (q.v.) and Western College. Pop. 2,200.

OXFORD CLAY, *in geology,* a term used by English geologists of the lower division of the Middle Oolitic (see Oolite), making up with calcareous sandstones the Oxford (or Middle) Oölitic group, and so corresponding to one of the upper sections of the Jurassic. It is a blackish, brownish or dark blue clay, rich in fossil ammonites and belemnites.

OXFORD COLLEGE, a college for women established in 1849 at Oxford, Ohio. Besides the regular collegiate work, there are courses in music and art, and provision for post-graduate work; there is also a preparatory department. The collegiate work is arranged in three courses, classical, literary and scientific, leading to the degrees of A.B., B.L. and B.S. There are about 150 students and 17 instructors.

OXFORD MOVEMENT, a religious movement in the Church of England which originated among certain members of Oxford University. Its aim was the revival of religious life and doctrine in England on a purer and more primitive basis. The Church of England in the early part of the 19th century was in a condition in which reform was sorely needed. The fervid spirit of John Wesley and his successors had kept the spark of spiritual life still glowing in the heart of the masses, and the Roman Catholic Church as a consequence of Catholic Emancipation was rehabilitating itself. There were two main parties in the Church of England. There was the great Evangelical party who "whether they were admired as Evangelicals, or abused as Calvinists, or laughed at as saints, were inheritors not of Anglican traditions, but of those which had grown up among the zealous clergymen and laymen who had sympathized with the great Methodist revival and whose theology and life had been profoundly affected by it." This party numbered many men of power among its ranks who kept alive the spirit of such pious and earnest leaders as Hervey, Romaine, Cecil, Venn, Fletcher, Newton and Thomas Scott. They trusted less in ordinances, or in ecclesiastical rites and traditions, than in the stirrings of the individual soul toward God, private study of the Scriptures and constant prayer.

In contradistinction to these Low Churchmen were the old-fashioned High Churchmen who had existed in the Established Church since the time of Laud. They clung to the learning of such theology as had become the heritage of the Church through the teaching of a line of solid divines from Hooker to Waterland. Bishop Wilson of Sodor and Man in his 'Sacra Privata' was their model of practical and personal devotion, but they also drew for their religious life upon the stores of Andrewes, Jeremy Taylor and Ken. They preached calm, scholarly sermons, which embodied a gospel of common sense; but did not appeal to the heart of the middle or lower classes. Besides these two great parties there was rising in the Church a spirit of free thought which should afterward develop into the Broad Church party of Stanley and Jowett. Connop Thirlwall and Julius Hare had become strongly tinged by the influence of recent German critical speculation, and Whately, Hawkins and Milman were looking for a wider field of religious life and conviction which should be bounded neither by the conventionalities of the Evangelicals, nor the somewhat frigid dignity and strictness of the High Church party.

The two chief leaders in the movement which was to bring a new life into the English Church were men of the very highest gifts — John Keble and John Henry Newman. There were two sides to the spirit of this movement; one was theological, the other moral. As illustrating these two aspects of religious life it is impossible not to cite the 'Christian Year,' which appeared in 1827 and embodied the essence of 'Tractarian' theology while it was warmed by the most pure and exalted ethical, if not ascetic, temper and tendency. When Newman began his ministry his sermons were remarkable for this same practical tone. His 'Holiness Necessary for Future Blessedness' was preached in 1826, before he was appointed vicar of Saint Mary's, and it struck the keynote of all his subsequent pulpit utterances. It was this intense moral earnestness that gave power and impetus to the new movement.

The political condition of England had much to do with the origin of the Oxford movement; Whig Erastianism was in the ascendant in Parliament; nor should the influence of the Romantic movement in literature with which the name of Walter Scott is associated be left out. When the definite movements began, the Reform Bill had just been passed, and it looked as if the government were about to invade the rights of the Church. It was at this time that a sermon of Keble's fired the train. «On 14th July 1833,» we read in Cardinal Newman's 'Apologia,' «Mr. Keble preached the assize sermon in the university pulpit. It was published under the title of 'National Apostasy.' I have ever considered and kept the day as the start of the religious movement of 1833.» The speaker described England as «a nation which had for centuries acknowledged as an essential part of its theory of government, that, as a Christian nation, she is also a part of Christ's Church, and bound, in all her legislation and policy, by the fundamental laws of that Church.» He proceeds to charge the nation with now disavowing this principle, a course which implies «a direct disavowal of the sovereignty of God. If it be true anywhere that such enactments are forced upon the legislature by public opinion, is Apostasy too hard a word to describe the temper of such a nation?»

The effect of Keble's sermon was to cause a meeting at Hugh James Rose's parsonage at Hadleigh, Suffolk, between the 25th and 29th of the same July. Next in authority to Rose as leader in the movement (after Keble, Newman and Pusey) was William Palmer, and he has himself described the feelings with which the «Conspirators,» as they were styled, met on that occasion. «We felt ourselves assailed by enemies from without and foes within. Our prelates — insulted and threatened by ministers of state. . . . In Ireland — 10 bishoprics suppressed. What was to come next? . . . We were overwhelmed with pamphlets on Church Reform. Lord Henley, brother-in-law of Sir Robert Peel, Dr. Burton, and others of name and influence led the way. Dr. Arnold of Rugby ventured to propose that all sects should be united by act of Parliament with the Church of England. Reports were prevalent that some of the prelates were favorable to alterations in the Liturgy. Pamphlets were in wide circulation recommending the abolition of the creeds (at least in public reading) . . . the removal of all mention of the Blessed Trinity; of the doctrine of baptismal regeneration; of the practice of absolution.» The party pondered over what was the best means of opening the eyes of churchmen, and it was resolved at Hadleigh that this could only be done by writing, by publishing certain declarations, certain manifestos, and thus to carry out the spirit of Keble's sermon. In this way were born what Mozley afterward called «that portentous birth of Time» 'The Tracts for the Times.'

The first tract appeared 9 Sept. 1833. It was written by Newman. He wrote, as he says, under the conviction «that ancient religion had well nigh faded out of the land through the political changes of the last 150 years, and it must be restored.» In the introduction he asserted the doctrine of Apostolic succession, and the ministerial power to give absolution. The early tracts produced a profound sensation. They wakened men's minds, and in many quarters the cry was raised that they contained «Romanism» in disguise; yet they quoted the Prayer Book, and the most authoritative English divines and even bishops were puzzled how to regard them. They were supplemented by the 'Churchman's Manual,' which explained the nature and claims of the Church and its ministers. In 1834 the party was joined by Edward Bouverie Pusey (q.v.), and he early contributed an elaborate tract on 'Fasting.' Between 1835 and 1840 the «Tractarians,» as the promoters of the Oxford movement were called, had swollen to the dimensions of a large party. As a protest against its alleged Romanizing tendency a monument was erected in Oxford to the martyrs of the Reformation, Cranmer, Ridley and Latimer, but the «Memorial» had little effect in arresting the progress of the movement which was on its way to win the coming generation of English clergy to maintain the doctrines of Apostolic Succession, Baptismal Regeneration, Priestly Absolution, the Real Presence in the Eucharist, and the Divine Character of the Church. But in a short time the authorities both of Oxford University and of the Church of England became alarmed. Sumner, bishop of Chester, was the first to condemn the movement by denouncing in 1838 «the undermining of the Protestant Church by men who dwell within her walls . . . who sit in the Reformers' seat and traduce the Reformation.» The Tractarians undoubtedly made mistakes and showed impatience, exaggeration and little consideration for the scruples of those who did not accept their teachings. When the tract was published entitled 'On Reserve in Communicating Religious

Knowledge,' they ventured on dangerous ground, and touched on topics not relevant to their main crusade, laying themselves open to the charge of avowing the principle of keeping back part of the counsel of God. But the formation of a «Romanizing» section in the Tractarian party was not justifiably charged against them until the publication of Tract 90, in which Newman attempted to show that the 39 Articles of the Church of England could be so interpreted as to harmonize with the teaching of the Roman Catholic Church. This was the turning point in the history of the movement. The Tractarian doctrine was condemned by the Heads of Houses at Oxford. The bishop of Oxford forbade the publication of such views, and Newman yielded. The Tractarian candidate for the professorship of poetry, a man of undoubted genius, was defeated, and Mr. Ward, another Tractarian, dismissed from his mathematical lectureship at Balliol, and the climax was reached when Pusey was accused and found guilty of preaching doctrine contrary to that of the Church of England and was suspended from preaching within the university for two years. Finally a movement was set on foot to procure a vote of censure on Ward's 'The Ideal of a Christian Church,' in which the Roman Catholic Church was set forth as that ideal and the English Church condemned as not fulfilling it. The motion was passed by a majority of 58 members of the Convocation, and only failed of being ratified by the vice-chancellor through the interposition of a legal technicality. On 3 Oct. 1845 Newman requested the provost of Oriel to remove his name from the books of the college and university, and on the 8th completed his 'Essay on the Development of Christian Doctrine'; two days afterward he was received into the Roman Catholic Church. A host followed him.

The movement within the Church of England itself continued under the leadership of Pusey, who deplored Newman's secession to Rome and who even in its early days, to quote Newman, had been «able to give a name, a power and a personality to what was without him a sort of mob.» The Gorham judgment (1850), in which the judicial committee of the privy council — which, being a civil court, the Tractarians claimed had no valid authority to act in ecclesiastical cases — decided that belief in Baptismal Regeneration was not necessary in order to hold a benefice in the Church of England, was followed by further secessions, among them, Manning. The Oxford revival, begun in the Church of England, profoundly affected all the Reformed churches, and while laying stress on ceremonial, on orderly and comely worship in the sanctuary and on the claims of the early Church and its creeds, laid no less emphasis on spirituality of life as an essential prerequisite for the priests and ministers of the Church. Consult in addition to the biographies and works of the outstanding figures of the movement whose names are mentioned in this article. Brown, E. G. K., 'History of the Tractarian Movement' (1856); Church, R. W., 'The Oxford Movement' (1891); Holland, H. S., 'The Mission of the Oxford Movement' (in 'Personal Studies,' 1905); Newman, 'Apologia' (1864), vitally important Mozley, T., 'Reminiscences' (1882); Overton, 'The Anglican Revival' (1897); Thureau-Dangin, 'The Anglo-Catholic Revival in the 19th Century' (Eng. trans., 1915); Ward, Wilfrid, 'The Oxford Movement' (1913); 'The Library of the Fathers' (1838-85); 'Library of Anglo-Catholic Theology' (1841). An exhaustive bibliography by Canon S. L. Allard appears in Vol. XII of the 'Cambridge History of English Literature' (1915).

OXFORD UNIVERSITY, England, at Oxford (q.v.), its foundation by tradition, ascribed to Alfred the Great, who had a mint in the city, is believed to have its authentic origin in the quarrel between Henry II and Becket, when the king, about 1164, directed an ordinance against the partisans of Becket, to the effect that all clerks possessing revenues in England and resident in Paris had to return in three months «as they loved their revenues.» Philip II of France was aiding Becket, and Henry forbade English clerks to study at Paris. Just after the edict the schools of Oxford became very flourishing and assumed the character of the contemporaneous university; the existence of doctors of various faculties as well as of masters and scholars being recorded about 1187 in connection with the celebrated visit of Giraldus Cambrensis. The earliest public document known to exist, which applies the title of university (*universitas*) to the schools of Oxford is one which dates from 1201. In 1214 the bishop of Lincoln, the ecclesiastical superior of the monks gathered within his diocese, appointed a chancellor for their government, and the constitution which arose out of such elements has been molded into its present form in part by the authority of the Crown and of Parliament, in part by the inherent self-governing power of the university itself. The first chancellor known to have been appointed was Robert Grossteste, about 1224, who was afterward bishop of Lincoln. Other authorities represent that its first charter was that granted to it by Elizabeth in 1570, when it was enacted that henceforth the university should be known by the name of «The Chancellor, Masters and Scholars of the University of Oxford,» and by no other name, upon which its privileges depended until the passing of the Oxford University Act of 1854. The elective franchise was conferred upon the university in 1604, since which time it has returned two members to Parliament.

The collegiate system at Oxford dates from the 13th century. At first the students who congregated at the university had no special places of abode provided for them, but had to find accommodations for themselves. As the students found it cheaper to unite and rent a single house in which they might live together than to provide each for himself, they frequently did so, forming halls, hostels or inns. Sometimes, for the sake of giving greater facilities to study, sums of money would be given or bequeathed to the university for the erection of buildings in which the students might live without any more expense than was necessary for their maintenance. The first who went further than this was William of Durham, who, dying in 1249, bequeathed a sum of money to the university to provide a permanent endowment for the maintenance of a certain number of «masters.» The first purchase was made in 1253, and with this purchase originated University College. There were two other colleges founded during the same century — Balliol College, in 1263, and Merton College, founded at Maldon in Surrey in 1264, and removed to Oxford before 1274. This last college is said to have been the first in which the collegiate system in its modern form, or a form resembling the modern one, was instituted, the college being made a separate corporation, with a separate charter and separate statutes. The first statutes of University College as a separate corporation are dated 1280. At the beginning of the 14th century, while there were no more colleges than the three just mentioned, there were about 300 halls. As the number of colleges increased, and their growing endowments attracted greater numbers of students, the halls declined in numbers, especially since the attendance of students diminished in the centuries following the 14th. At the beginning of the 16th century the number of colleges had increased to 10, while that of the halls had declined to 55. There are now 21 colleges, all of which are separate corporations, and, with two exceptions, have endowments for fellows and scholars. At Christ Church the fellows are distinctively called «students» (ordinary students being, of course, called undergraduates). All Souls College has no scholars or undergraduates, except a small number of «Bible-clerks,» and Keble College has no fellows. The fellows and scholars at Oxford hold pretty much the same position as at Cambridge (see CAMBRIDGE, UNIVERSITY OF, and FELLOWSHIP). Besides the colleges, there is one public hall, Saint Edmund Hall. It is not a separate corporation, and has no endowments for fellows, and it will be united to Queen's College on the occurrence of the next vacancy in the principalship, as Saint Mary's Hall has been incorporated with Oriel. The following are the names of the colleges in the order of their reputed foundation, each being separately noticed in the body of this work: University, Balliol, Merton; Exeter (founded 1314), Oriel (1326), Queen's (1340), New College (1379), Lincoln (1427), All Souls (1437), Magdalen (1458), Brasenose (1509) Corpus Christi (1516), Christ Church (1546), Trinity (1554), Saint John's (1555), Jesus (1571), Wadham (1612), Pembroke (1624), Worcester (1714), Hertford and Keble. The two last mentioned date from last century. Hertford is the restoration of an old foundation, while Keble (which is a «new foundation» and not a college in the strict sense) was founded in 1870 for the education solely of members of the Church of England; it enjoys the privileges (except as regards the academical status of its head) which are possessed by other colleges in the university. There are also three private halls, governed by «licensed masters»; and since 1884 one college and four halls for women have been established, Somerville College and Lady Margaret, Saint Hugh's and Saint Hilda's halls. Women cannot become members of the university or take degrees, but are admitted to the university examinations, and the names of those who pass or take honors are officially published. The largest of the colleges is Christ Church, established in 1546 by Henry VIII, from funds collected by Cardinal Wolsey; it is commonly known as «the House» («Ædes Christi»). In the 15th century an enactment was passed requiring all students who joined the university to become members of some college or hall, and this condition continued to be the law until 1868, when persons were permitted, under certain conditions, to enjoy the privileges of the university without so doing, keeping their statutable residence in approved houses or lodging in the town. Those who avail themselves of this permission are called «non-collegiate students.» They are exempt from the heavy expenses inseparable from living in college rooms and pay small tutorial fees.

The constitution of the university is fixed by the act of 1854, which modifies that granted by the act of Elizabeth. The style or title by which the corporation is known is The Chancellor, Masters and Scholars of the University of Oxford. Legislation in university matters has to be prepared by the Hebdomadal Council, and pass through two bodies, the Congregation of the University and Convocation. There is also another body, the Ancient House of Congregation, made up of the *necessario regentes* and *regents ad placitum,* whose functions are confined to ratifying the nomination of examiners and to the granting of ordinary degrees. The House of Convocation consists of all who have been admitted to the degree of master of arts, provided their names have been constantly kept on the books of some college or hall, or of the delegates of non-collegiate students, and in the last resort Convocation has supreme control over the action of the university. Congregation consists of all masters and doctors resident in Oxford, and most matters are settled by it, appeals to the superior body of Convocation against a decision of Congregation being rare. The Hebdomadal Council consists of certain officials and certain members elected by Congregation. The official members are the chancellor, the vice-chancellor and the two proctors. The elected members are six heads of colleges or halls, six professors and six members of Convocation of not less than five years' standing. The members of Convocation elected may be either heads of houses or professors. The election takes place once in three years. The elected members hold office for six years, and half of them are chosen on every occasion. They meet every Monday in term time (whence the name of the body), and when convoked by the vice-chancellor. All legislative measures originate with them, but most of the ordinary business of the university is transacted by boards of delegates or curators elected or appointed *ad hoc.*

The principal officers of the university are the chancellor, the high steward, the vice-chancellor, the two proctors, the public orator, the keeper of the archives and the registrar. The dignities of chancellor and high steward are almost purely honorary, and are usually conferred on noblemen. The vice-chancellor, who is nominated by the chancellor from the heads of colleges, and chosen in the order of their election as heads, holds office for four years, and is now, in fact, the supreme executive and judicial authority of the university. The principal duty of the proctors is to maintain the discipline of the university, but they also serve ex officio on most of the university boards and delegacies.

There are over 100 professorships, lectureships and readerships in the University of Oxford, besides the lectureships, etc., in the separate colleges. The university professors deliver lectures on the subjects for which they hold their professorships, but attendance on these lectures is compulsory on none of the students.

The colleges are corporate bodies distinct from the corporate body which forms the university. They are not subject to laws and regulations made by the university; they manage their own property, elect their own officers and even the proctors have no power within their walls. Some university professors are entitled to privileges and emoluments in colleges, and in many matters the colleges and the university recognize each other's regulations. But the true key to the intimate relations existing between the university and colleges is to be found in the fact that the great majority of the members of the university belong to the colleges and all members of the colleges are members of the university.

The old distinctions separating undergraduates into different classes (peers and their eldest sons, fellow and gentlemen commoners) have disappeared. "Scholars," that is students who by competitive examination have obtained a place on the foundation of a college — carrying with it a stipend of $400 — wear gowns differing from those of ordinary students or "commoners." Every student on entering his college is assigned to a tutor, who is responsible for the direction of his studies, and to whom he may apply for advice. The morning is devoted to attending lectures, or to private reading; the afternoon or the early part of it is universally surrendered to outdoor exercise; the evening after "hall" (the common name for dinner), is given by reading men to their studies, as well as to the social and literary meetings which form so much of the charm of college life. There is a university club, known as the Union Society, in whose hall there is held a weekly debate on some public topic. There are also a dramatic club and various musical societies which give performances regularly during term, besides many social clubs. The expenses of living at Oxford vary as the students; on the most economical system they cannot be brought below $800 per annum. The total number of undergraduates on the book is about 3,600, but the number of those resident is usually 3,000. During the Great War the members were reduced almost to the vanishing point.

There are four terms in the university year at Oxford; Michaelmas term, which lasts from 10 October to 17 December; Hilary or Lent, from 14 January to the day before Palm Sunday; Easter term, from the Wednesday after Easter to the Friday before Whitsunday, and Trinity or Act term, from the day before Whitsunday to the Saturday after the first Tuesday of July; Michaelmas and Hilary terms are kept by six weeks' residence in each and Easter and Trinity terms either by three weeks' residence in each or by 40 days' residence in both jointly.

The degrees conferred by the university are those of bachelor and master in arts; bachelor and doctor in divinity, civil law, medicine, letters, science and music and bachelor and master in surgery. The most important function of the university, however, is the conferring of degrees in arts. Twelve terms of residence are required for the degree of B.A., which must be taken before any other degree (except those of B. Litt. or B. Sc. and bachelor or doctor of music) can be conferred. No further residence is necessary for any degree, and no residence whatever is required for degrees in music. Candidates for the degree of B.A. must pass three distinct examinations: Responsions (known among undergraduates as "Smalls") before the masters of the schools (six in number); first public examination (Moderations or "Mods") before the examiners known as moderators (in the pass school six, in the classical School seven, in the mathematical three); and the second public examination (or "Greats") before the public examiners (six in the Pass School, five in the school of *literæ humaniores*, and three, four or five in each of the other eight honor schools, namely, mathematics, natural science, jurisprudence, modern history, theology, Oriental studies, English literature and modern European languages). Candidates are admitted to pass Moderations at their second term, and to a Final Pass School as soon as they have passed Moderations. Honors may be obtained in each of the two public examinations. The first consists of an examination in Scripture, or an alternative Greek or Oriental book, and in either classics or mathematics for a pass or honors. Candidates are admitted to the honors examination only from the fifth to the eighth term from their matriculation, and are put to a much severer test than candidates for a mere pass. The successful candidates are arranged by the moderators according to merit in four classes, in each of which the names are published in alphabetical order — a feature of Oxford honor lists. In the second public examination honors are conferred in each of the nine honor schools already mentioned. Successful candidates are arranged by the public examiners in four classes according to merit, and their names published in these classes in alphabetical order. Candidates in the Pass School are examined in three subjects chosen from the following four groups: (1) Classics, classical history, Sanskrit and Persian; (2) Modern languages and history, political economy and a branch of legal study; (3) Mathematics and six branches of natural science; (4) Religious knowledge. Not more than two subjects may be chosen from any one group, but one of the subjects must either be classics (two books in Greek or one Latin and one Greek), Sanskrit, Persian or a modern language (either French or German, with composition and literary history). A B.A. may proceed to the degree of M.A. without further examination or exercise, in the 27th term from his matriculation, provided he has kept his name on the books of some college or hall, or upon the register of non-collegiate students, for 26 terms. In the case of all other degrees (except honorary ones) some examination or exercise is necessary.

Affiliated colleges are Saint David's College, Lampeter (1880); University College, Nottingham (1882); Firth College, Sheffield (1886); University College, Reading (1899); Hartley University College, Southampton (1903); Exeter Diocesan Training College (1906); Royal Albert Memorial University College, Exeter (1908), and a number of colonial universities.

Students accredited from these affiliated colleges are admitted to the Oxford public examinations after a reduced period of academical residence, they are not required to pass Responsions, and can take their B.A. degree after eight terms' residence, provided they have obtained honors at either the first or second public examinations.

The University of Oxford possessed the patronage of few church livings in its own right, but through an act of James I, Roman Catholics are disabled from presenting to any ecclesiastical benefice and their rights within 25 of the counties of England and Wales are made over to this university, those in the other 27 counties being conferred on that of Cambridge. Many of the colleges possess considerable ecclesiastical patronage. There are between 30 and 40 scholarships and exhibitions in the gift of the university, besides those belonging to the various colleges and halls. Of international importance are the Cecil Rhodes scholarships, dating from 1902, each of the annual value of $1,500, to be held by students from every important British colony, from Germany and from every State and Territory of the United States of America. There are also several valuable prizes, such as the Stanhope, for a historical essay; the Newdigate, for an English poem; and the Gaisford, for composition in Greek prose and verse. The Radcliffe traveling fellowships are awarded to enable students of natural science to prosecute their studies abroad. Consult Clark, 'The College of Oxford' (1891); Corbin, 'An American at Oxford' (1903); Fulleylove and Thomas, 'Oxford' (1904); Gribble, 'The Romance of Oxford Colleges' (1911); Hutton, 'Literary Landmarks of Oxford' (1903); Lang, A., 'Oxford Notes' (1879); Lyte, 'History of the University of Oxford' (1886); Rashdall, 'Universities of Europe in the Middle Ages' (1895); Smith, Goldwin, 'Oxford and Her Colleges' (1895); the series of 'College Histories' and the 'University Calendar'; Vallace, 'Old Colleges of Oxford' (1912), and the 'Student's Handbook to the University and Colleges of Oxford.'

PHILIP MOLYNEUX,
Editor of the Oxford University 'Gazette.'

OXIDASE, any member of a certain group of enzymes, which are distinguished, as a class, by their power of inducing the direct oxidation of sugars and certain other substances. The chemistry of the oxidases is very imperfectly known, but the group appears to be widely distributed in the vegetable kingdom, and it probably plays an important rôle in the chemical changes that occur in the growing plant. Oxidising enzymes are also found in animals. Artificial oxidases have been prepared by Davy-Henault from faintly alkaline solutions of gum treated with solutions of manganese salts.

OXIDE, *in chemistry*, a compound formed by the direct union of oxygen with a metallic base or with an organic radical. The oxides may be classified, in a general way, as acid, basic and neutral. An acid oxide is one which has acidic properties or which combines with the elements of water to produce an acid. Sulphur trioxide, SO_3, is a familiar example of this class of oxides, as it unites directly with water to produce sulphuric acid. Basic oxides are those which have basic properties or which are capable of uniting with acids so as to produce salts. Calcium oxide (lime), CaO, is of this character. Neutral oxides are those which are neither acid nor basic in any marked degree. The magnetic oxide of iron, Fe_3O_4, is an example of this class. The oxides are also classified in accordance with the proportion of oxygen and base that they contain. When two oxides of the same base are to be distinguished, that which contains the more oxygen in proportion to the base is sometimes called the peroxide, the other being called the suboxide. CuO, for example, may be called copper peroxide, and Cu_2O copper suboxide. These particular terms, however, are not used as generally as formerly and are usually applied to the highest and the lowest oxides in a series of more than two. The term protoxide is sometimes applied to a neutral oxide which contains a single oxygen atom in combination with one atom of a divalent base or with two atoms of a monovalent base. An oxide containing one, two, three, four or five atoms of oxygen is called the monoxide, dioxide, trioxide, tetroxide or pentoxide of the corresponding base. Occasional departures from this simple rule will be met with in modern chemical nomenclature, but in such cases the anomaly is due to some peculiarity in the behavior of the oxide or to the difficulty of changing a name after it has once been definitely adopted, even though it be erroneous when judged by correct principles. The gas whose formula is NO, for example, is commonly known as nitrogen dioxide, as though its formula were N_2O_2. A sesquioxide is an oxide containing three atoms of oxygen to two of the base; the name being derived from a Latin word signifying "one and a half." Sesquioxide of iron, for example, has the formula Fe_2O_3. See PEROXIDES.

OXLEY, ŏks'lĭ, **James Macdonald**, Canadian author and lawyer: b. Halifax, Nova Scotia, 22 Oct. 1855; d. 1907. He was graduated from Dalhousie University, Halifax, in 1874, studied at Harvard in 1876–77 and was admitted to the bar in 1878. He practised law in Halifax in 1879–83, when appointed legal adviser in the Dominion Department of Marine and Fisheries. He resigned from this office in 1891 and engaged in the life insurance business in Ottawa and Montreal. Beside 'Nova Scotia Decisions' (1880–83), of which he was joint editor, he has written a long series of boys' books, such as 'Donald Grant's Development' (1892); 'Archie of Athabaska' (1893); 'In the Swing of the Sea' (1897); 'Fife and Drum at Louisburg' (1899), etc., and 'Lhasa at Last: a Journey to the Forbidden City of Tibet' (1900).

OXNARD, ŏks'närd, Cal., city in Ventura County, on the Southern Pacific and Ventura County railroads, 65 miles northwest of Los Angeles. It contains a public library, beet-sugar mills and refinery, machine shops, woodworking establishments, etc. The city owns the water-supply system. Pop. 2,555.

OXUS, ŏk'sŭs, or **AMU DARYA**, ā moo'-där'yă, a river of central Asia. It is formed by the confluence of the Pamir and Ab-i-Panja rivers in the Pamirs. The Pamir, which flows from Lake Victoria, 13,400 feet above sea-level, and the Oxus after the confluence of the Ab-i-Panja and the Pamir, form the greater part of the boundary between Afghanistan and Russia. This part of the river is about 680 miles long; the course is first for about 150 miles in a direction, in general, westerly, then north for 120 miles, then west-northwest for about 50 miles, then southwest for 100 miles. Here it leaves the mountains which have previously come down almost to its banks and runs about 260 miles west through plains, which are particularly wide along its southern bank. From the confluence of the Kunduz near the beginning of this stretch to the mouth there are no affluents on the southern bank, for all streams to the south are swallowed up by the sands of the desert. The greatest width of the Oxus at flood is over 1,000 yards, its greatest current is five miles per hour. The stream is fordable at a few places in the plains. Elsewhere it is crossed on rafts made of inflated skins or on ferries worked by swimming horses. At Charjui the river is crossed by a railroad bridge on the Merv-Bokhara line. The river is navigable below Charjui, which is about 150 miles from the Afghan border, and there is a regular service by flat-bottomed paddle steamers as far as Pata Kissar. Consult Rawlinson, Sir H. C., 'The Road to Merv' ('Proceedings' of the Royal Geographical Society, new series, Vol. I, London 1879); Krapotkin, 'The Old Beds of the Amu-Darya' (*Geographical Journal*, Vol. XII, London 1898).

OXY-ACIDS, according to older chemical usage, are acids which contain oxygen; those containing hydrogen without oxygen being called hydracids. Nitric acid, HNO_3, for example, was called an oxy-acid, while hydrochloric acid, HCl, was called a hydracid. The term oxy-acid is not often used in this sense at the present time, but organic acids which contain the radical hydroxyl, OH, are frequently called oxy-acid, or, more correctly, hydroxy-acids. The organic acids of the lactic acid series, for example, may be regarded as derived from those of the acetic acid series by the substitution of a molecule of hydroxyl for an atom of hydrogen and they are, therefore, oxy-acids or hydroxy-acids, according to the more modern terminology. Acetic acid, for instance, has the formula $CH_3.COOH$, and glycollic acid (which belongs to the lactic acid series) has the formula $CH_2OH.COOH$. Glycollic acid may, therefore, be regarded as oxy-acetic acid or hydroxy-acetic acid, if considered as being derived by substituting OH for one of the hydrogen atoms of the methyl group in the acetic acid. Lactic acid itself may be regarded as hydroxy-propionic acid, the formula of propionic acid being $C_2H_5.COOH$, while that of lactic acid is $C_2H_4OH.COOH$. Oxy-acids are thus alcohols at the same time as they are acids.

OXYACETIC ACID. See Glycollic Acid.

OXYGEN. See Liquefied and Compressed Gases.

OXYHÆMOGLOBIN. See Hemoglobin.

OXYHYDROGEN LIGHT. See Calcium Light.

OXYRHYNCHUS, Egypt, an ancient town, now represented by Bahnasa on the Bahr Yusuf or Joseph Canal, about 100 miles south of Cairo. The site presents mounds of ruins, covering an area unsurpassed by few ancient Egyptian towns. Opened and explored since 1897, these mounds have yielded rich finds in papyri containing many precious treasures of lost classical and early Christian literature. Greek papyri unearthed in 1897 and in 1903 include 3d century fragments of the "logia" or "Sayings of Jesus." (See Agrapha). Among the Latin papyri is a fragment of the epitome of Livy's history covering books 37-39 and 49-55. On the back of this papyrus is written the largest piece of the New Testament on papyrus yet discovered, namely, the Epistle to the Hebrews. Another fragment comes from the Septuagint version of Genesis — a century older than extant vellum manuscripts of the same book. Among other Greek papyri is a 1st century B.C. copy of an epinician ode, by a poetess, perhaps Corinna, the rival and reputed teacher of Pindar; epigrams by Leonidas, Antipater and Amyntas; part of a philosophical dialogue in which the tyrant Pisistratus is one of the speakers; a long 2d century papyrus contained an invocation to a goddess, and on the back an account of a miraculous cure effected by Imhotep, the Asclepius of the Greeks and the Æsculapius of the Romans. Other finds comprise portions of the works of Homer, Herodotus, Thucydides, Sophocles and other classical authors, commercial and legal documents, private letters, etc., throwing interesting sidelights on social life in Egypt during the Greek and Roman dominations. In early Egyptian times called Pempte, the capital of a nome, here the Oxyrhynchus or "sharp-mouthed fish" was worshipped, while at Cynopolis (Dog Town), the neighboring city, the dog was revered, as recorded by Plutarch in the quarrels that arose between the two cities over the mutual revilings concerning the respective sacred animals. Oxyrhynchus had a flourishing Greek colony under the Ptolemaic dynasty. With the advent of the Christian era convents were established which attained a population of over 20,000 monks and nuns, to whom are due the wealth of ancient literature preserved and since discovered among the ruins. Consult Grenfell, B. P., and Hunt, A. S., 'The Oxyrhynchus Papyri' (London 1898-99), and 'New Sayings of Jesus and Fragment of a Lost Gospel from Oxyrhynchus' (London 1904).

OXYRHYNCHUS, the name given by the Greeks to a fish of the Nile (*Mormyrus oxyrhynchus*), formerly reverenced by the Egyptians, who refrained from eating it. It was sacred to the goddess Hathor and is frequently represented on sculptures and coins. The Egyptians embalmed and buried the oxyrhynchus with great pomp. It has a long snout and a pseudo-electric organ. Its modern name is "mizdeh." See Mormyrus.

OXYSALT, or **OXISALT**, a salt of an oxy-acid. See Oxy-acids.

OXYURIS, a genus of small thread-worm parasite in man; the male of *O. vermicularis* is about one-sixth of an inch and the female about half an inch long, and inhabits the rectum of children and of old people in numbers, setting up inflammation. See Nematoda; Thread-worm.

OYAMA, ō'yä'mä, **Prince**, Japanese field-marshal: b. Satsuma, 1842; d. 10 Dec. 1916. He was a cousin of the famous Saigo Takamori, who headed the Satsuma Rebellion of 1877–78. Oyama fought on the side of the Imperialist forces during the war of the restoration, and was one of the earliest students of foreign military methods, having been dispatched to Europe by the government at the time of the Franco-Prussian War, when he attached himself to the Prussian forces, remaining at his post until the conclusion of the siege of Paris. Shortly after his return the Satsuma Rebellion broke out and Oyama commanded a brigade of the Imperial forces dispatched against his cousin. Oyama did not hesitate to apply his Western skill and experience to the undoing of the rebels, and in September 1877 he returned in triumph to Tokio. He was soon afterward promoted to the rank of lieutenant-general and appointed chief of the general staff. In 1880 he was again given a portfolio as Minister of War. In 1894, when war with China broke out, he went to Manchuria in command of the second army, which captured Port Arthur and Wei-Hai-Wei. His record took the form of a succession of triumphs, and at the close of the struggle he was promoted to the rank of marquis. By 1898 Oyama had been advanced to the status of field-marshal. In the war with Russia, Oyama acted as commander-in-chief, and added to his reputation by a series of victories. A princedom was bestowed upon him for this achievement. The Princess Oyama was among the first of the girl students to be sent abroad by the empress in the early seventies, and spent many years in the United States.

OYER (oi'ẽr) **AND TERMINER**, tẽr'mi-nẽr **Court of.** See COURT.

OYOMEI PHILOSOPHY. Wang Yang-ming (q.v.), pronounced Oyomli, in Japanese, propounded a system of thought, which reproduced and expanded in Japan, from 1650 to 1850, fed the minds of almost every one of the men who created New Japan. In place of the original Chinese religion, when the forefathers worshipped a personal god, Confucianism substituted an abstract entity devoid of personality. After Confucius (q.v.) had set down in literary form the traditions and teachings of the ancients, in the canon of the Five Classics, these books became the basis of all Chinese culture and the point of departure for all philosophic discussion, during 25 centuries, the commentaries being countless and the derivative literature uniquely voluminous, among which the names of Mencius (q.v.) and Chu Hi (q.v.) are the chief. The former expounded the system of the sage, making it a political organon, with a strong flavor of democracy — so much indeed that when the Chinese heard of the government of the United States of America, they imagined that "the barbarians" had got their ideas from Mencius! After the long struggle with Taoism (q.v.) and Buddhism, Confucianism, in its mediæval statement by Chu Hi, issued, not merely as a canon or a ritual, but as a pantheistic creed. According to this, the one abstract principle evolved out of itself the Great Absolute (Ri), primordial cause of all existence. In its motion, the male principle was produced; in its rest, the female. Thus heaven and earth were made and through the supreme cause eternally continuing its activities, all things, animate and inanimate, came into being. This breath of nature (Ki), or the energy animating these two ever-acting principles, which never cease working, follow fixed, inscrutable and immutable laws. To be in harmony with these laws is man's chief end of being. The system of Chu Hi was eclectic, for he sought to show that in the various schools of thought much the same substance of truth was taught; and also conservative; and indeed these were largely accepted as the teaching of the past. Yet against this scientific philosophy and critical erudition based on realism was the idealistic intuitionalism of his contemporary Lu (b. 1140 A.D.) whom the Japanese call Riku, who considered that the keeping of the heart aright was the beginning and aim of all study. He, however, wrote little, but Oyomei (Wang Yang-ming), his first great follower, was a man, skilful with pen and tongue, of infinite wit, rich in humor, apt in illustrations and possessed of a fine literary style. Instead of repeating past wisdom, he sought to find all truth within his own heart. The heart and Ri are one. If a man knows his own heart, he knows the way and heaven. To act is to know. If we do not act right, we do not know. (*Exitus acta probat*). All knowledge is useless that is not expressed in acting. The system of thought elaborated by Chu Hi, when introduced into Japan in the 17th century, won the adherence of educated men, displacing Buddhism, which was abandoned to the lower classes. As in China, it was adopted as the official orthodoxy by the government, for in it the Yedo usurpers saw a formidable ally and support for their despotism. Thinkers of different mind ran the risk of ban, persecution or death. Yet already, disciples of Oyomei had begun to expound and apply a doctrine possessing so peculiar a charm and one harmonizing so subtly with the Japanese temperament. To them, as led by Oyomei, the whole universe was incessantly surging on to higher spheres of development and calling upon men to join its glorious advance. Moreover, their good works were quickly manifest in philanthropy, the economic improvement of the landscape, the fertility of the fields and the morals of society. Nakae Toju (1608–49), the pioneer expounder of Oyomei, was popularly known as "the living Confucius." Another champion of Oyomei has left a superb monument in his engineering feats of irrigation, but had to suffer for alleged heresy and died officially disgraced, in exile. The Japanese thinkers went further in their conception of cosmic force, and using the modes of thought so long in use among the Zen (contemplative) sect of Buddhists, they reached conclusions, curiously akin to those of the modern evolutionists, which prepared the way for the enormous vogue in recent years of the Occidental theorists in the physical sciences. The dragon was their favorite symbol of the supreme power of the universe. They sought even to penetrate behind the mask, which change imposed on all things. In spite of the hostility of the orthodox academicians in Yedo and the terror of the censorship, the new ideas of Oyomei, which called for a reconstruction of society and government, steadily gained ground. Satsuma, Choshiu, Hizen, Tosa, the provinces whence nearly all the great statesmen of modern Japan have arisen, formed the stronghold of this philosophy, while in Echizen, Yokoi, who sent the first students to America, was its chief expounder. Most of the generals and admirals, distinguished in the wars with China and Russia, were brought up in the Oyomei philosophy. Action, which looked to political reconstruction, began at Osaka in 1837, when Oshiwo, a famous Oyomei scholar, led a revolt, which in time of famine opened the granaries to the starving poor. While Bushido (q.v.) was taught only for practical benefit and never became a philosophy, Oyomei fed the men who hungered for intellectual justification of their protests against the Yedo despotism and of their actions, technically lawless but inherently righteous. Their proceedings, in overthrowing dualism, restoring the Mikado's supremacy, abolishing feudalism, tolerating Christianity and granting freedom of conscience, were all, in their minds, the logical result of Oyomei, which thus demonstrated its true nature. At the antipodes of the quietism and conservatism, both of the archaic and the neo-Confucianism, Oyomei meant stimulus, progress, an alert mind that welcomes the new, when it is demonstrably true, and confesses fault when discovered, even in the old ideas and time-honored custom. Nothing so explains the cause and reason for the New Japan, excelling in potency by its interior force all foreign influences, as does this intellectual discipline, begun nearly two centuries before Commodore Perry, and which gave the nation its new mind. Yet even in this history, the trend of the true genius of Japan is discerned — which is ever impatient with the abstract and is eager for the practical. Oyomei, as expounded in Japan, transformed mediæval Confucianism into an immediate working principle for the individual, while calling for a vital relation between knowledge and action. In this light, Japan is no "enigma," and the Japanese are not "Oriental," according to vulgar ignorance or associations, but are normally human.

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OYSTER BAY, N. Y., town in Nassau County, on the north coast of Long Island, on an inlet of Long Island Sound, and on the Long Island Railroad, about 15 miles east of New York and 28 miles from City Hall. It is connected by steamers with New York and the large sound ports. Its name comes from its principal industry — cultivating oysters. It is a favorite watering-place. Sea Cliff (pop. 1,694) and Farmingdale (pop. 1,567) are villages in the town. It contains the home of the late ex-President Roosevelt. The government is administered by town meetings held biennially. Pop. 29,948.

OYSTER-CATCHER, a shore-bird of the plover family, several species of which constitute the genus *Hæmatopus*. The bill is of great length, pentagonal at its base, slightly bent upward and flattened or compressed at the apex, which is truncated. Oyster-catchers frequent both sea-coasts and inland waters, picking up small mollusks, crustaceans, sand-worms, etc. They are 18 to 20 inches long, and their plumage is handsomely variegated with black, white and brown, so that the Old World species (*H. ostralegus*) is often called "sea-pie" in England. The familiar American species is *H. palliatus*, it is white below, blackish brown on top, with a band of white on the wings. It is to be found in all parts of the country, but is rare northward of the middle parts. Consult Elliot, 'North American Shore Birds' (1895); Newton, A., 'A Dictionary of Birds' (London 1896); Sandys and Van Dyke, 'Upland Game Birds' (1902).

OYSTER-CRAB, or **PEA-CRAB**, a small crab (*Pinnotheres ostreum*) which dwells inside of the shells of American oysters as a commensal (see COMMENSALISM). Other species inhabit other host-shells in various parts of the world, one associated with a Mediterranean *Pinna* being the subject of some pleasant classical legends. These small crabs are excellent eating, but the difficulty of getting them in any considerable quantity makes them a costly dainty.

OYSTER-FISH, a local name for the tautog (q.v.).

OYSTER PLANTS, VEGETABLE OYSTER, SALSIFY, or **SALSAFY**, a biennial composite herb (*Tragopogon porrifolius*). When in flowers it is about four feet tall, bears grass-like leaves and showy, purple flowers, which close before noon. It is a native of Europe, whence it has spread as a weed to many countries. The cultivated varieties are grown for their gray tap-roots, which are often a foot long and two inches in diameter, and which suggest the flavor of oysters. The seed should be planted in deep, rich, well-drained soil as early in the spring as the ground can be worked, the drills being 15 or 18 inches apart. The plants must be cleanly cultivated until their tops cover the spaces between the drills. In late autumn part of the crop should be dug, the remaining part being allowed to stay until spring. Freezing does not harm the roots; indeed, they are believed to be better flavored if so treated. The stored roots are very apt to shrivel, become tough and lose flavor. Cool, moist storage, or pits, or especially burial in dry, clean sand obviate this difficulty. The plant succeeds best in cool climates and should be in every home garden. As a commercial vegetable it is of far less importance than parsnips and carrots.

OYSTER-SHELL BARK-LOUSE. See SCALE INSECTS.

OYSTERS, lamellibranch or bivalve mollusks of the family *Ostreidæ*, more strictly, edible species of the genus *Ostrea*, though the name is sometimes applied to other *Pelecypoda*, as the hammer oysters and pearl oysters of the family *Aviculidæ*. In the true oysters (*Ostrea*) the shells are irregular, the two valves unequal and the hinge without teeth. The animal is attached to some submerged object by the left valve, which becomes hollowed out to receive the body, while the right valve, which is free, is flattened or may be even concave from above. The shells are closed by a single adductor muscle, popularly called "heart," which extends from about the centre of one valve, through the animal, to the other. The edges of the mantle are free from each other and are fringed upon the margin. The gills (called "beard" in cook-books) are nearly equal and coherent dorsally, and the labial palpi are triangular. The oysters are peculiar in that the intestine does not run through the heart, which lies anterior to the muscle, while the foot is small or even entirely absent, a result of the sedentary life.

About 70 recent species of *Ostrea* are recognized, mostly inhabitants of the warmer seas. The most important species are the common oysters of Europe (*O. edulis et al.*), the *Ostrea virginiana* of the eastern coast of America, and the Japanese oyster (*O. cucullata*). The first-mentioned species occur from Norway and the Baltic to England and into the Mediterranean, another species of less importance (*O. adriatica*) taking their place in the eastern Mediterranean and the Black Sea. At one time *O. virginiana* ranged along our whole eastern coast, from the Gulf of Saint Lawrence to the Gulf of Mexico, and was used extensively by the Indians, but since the growth of civilization there it has disappeared from the whole coast between Nova Scotia and Cape Cod. There still remain beds in the Bay of Chaleurs and around Prince Edward Island. It has been introduced at points on the Pacific Coast. On the Pacific Coast two native species are eaten, *O. conchophila* of California and *O. lurida* of the coasts farther north. In the tropics species belonging to the subgenus *Alectryonia* become attached to the roots of the mangroves and are exposed at low tides; these are the so-called "tree oysters" or mangrove oysters.

Oysters, like all other mollusks, reproduce exclusively by eggs. Our *O. virginiana* has the sexes separate, but the European oysters and one of the Pacific species are hermaphroditic. The Eastern oyster is very prolific, producing from 10,000,000 to 60,000,000 eggs. Fertilization takes place by the admixture of the ova and sperm in the water. From the eggs there hatch out small, free-swimming larvæ, which swim about until after the first appearance of the shell, and thus aid in the distribution of the species. They swim by means of a ciliated velum or foot, and the valves of the horny larval shell are symmetrical like those of a clam, while the single muscle uniting them is not the same as that which appears in the adult. After a few days this free life ceases and the young become attached by the left mantle fold, which secretes a limey deposit at its margin. They are known as "spat" and grow rapidly, feeding upon the microscopic life in the water which is conveyed to the mouth by the cilia covering all parts of the body, and especially the gills and labial palpi. When large enough for transplantation the young are termed "seed oysters." As will be seen from the foregoing, the oyster needs some solid support upon which to attach itself, otherwise it would sink in the mud and become smothered. In nature this support is furnished by reefs of rocks or by banks of old oyster shells.

On the natural oyster beds a very small percentage of the eggs is ever fertilized and vast numbers of the swimming larvæ are destroyed by failure to secure attachment, or by being swallowed by certain surface-feeding fishes or by numerous lower animals which, like the adult oysters, sweep their food into the mouth by ciliary action. Many young oysters are destroyed by a host of enemies that prey upon them; others are suffocated by luxuriant plant and animal growths, including older individuals of their own species, or by sedimentary deposits; sudden freshets kill great numbers; storms tear them up and cast them ashore, and those which, like the "raccoon" oysters, live on tidal flats are sometimes destroyed in great numbers by ice in the winter or by too long exposure to the sun's rays in summer. Notwithstanding all this destruction the oyster is so prolific that, except along the New England coast north of Cape Cod, where a change in physical conditions has proved detrimental to its existence, the beds have continued to extend until subjected to the destructive influence of the white man, and have become the foundation for the development of a mutualistic fauna and flora almost as rich, varied and complex as that of a coral reef.

Culture.— As long as the market for Eastern oysters was limited to a relatively narrow belt along the seaboard, and before the population of some parts of this region had reached its present congested state, the extensive natural beds of Chesapeake Bay and other parts of the coast afforded a sufficient supply. Increasing demand long since led to over-fishing, which menaced the natural beds and compelled the development of new ones by planting suitable barren bottoms, often in regions where the oyster does not naturally breed. Extensive acreage has thus been developed and rendered productive, especially in Long Island Sound and other regions where suitable riparian laws secure the rights of private ownership. Attempts to establish close seasons and similar legislative devises have proved of little avail and have generally led only to more intensive harvesting during the open season. With the further widening of the market, due to improved transportation facilities and the introduction of the refrigerator car, the demand has severely pressed upon all sources of supply. This healthy condition of the oyster industry has stimulated a serious interest in the problems and possibilities of oyster culture and has led to the survey of suitable grounds for planting, from New Jersey to Texas. Vast neglected areas in the shallow bays and sounds along many parts of our coast could, by intelligent preparation and planting to oysters, be transformed from unproductive mud banks into rich sources of food supply and revenue. But no one should venture into this field without a full understanding of the complex biological and physical factors involved. To do otherwise is to invite disappointment and financial loss.

The successful maintenance of planted oysters is dependent upon the proper consideration of the character of bottom, the depth, temperature and density of the water, the food supply for the growing oysters, the rate of sedimentation and the methods of collecting the marketable oysters, combating enemies and many minor matters.

Selection of a suitable bottom is of prime importance, and the ideal condition is found in one presenting a firm substratum of stones or clay covered by two or three inches of loose organic mud. The first furnishes a foundation, the latter a suitable nidus for the growth of the minute organisms which constitute the oyster's food. Rocky, clayey or sandy bottoms are generally poor food producers, and the latter are peculiarly liable to shifting by currents, with a resulting burial and destruction of the oysters. Deep, soft mud engulfs and suffocates the oysters. Too rapid a deposition of sediment has the same result and is especially fatal to young and small oysters.

As indicated by their extensive geographical distribution oysters naturally withstand a range of temperature from below freezing to above 90°, but when subjected to these extremes they undoubtedly deteriorate and in time succumb. In common with other organisms oysters grow most rapidly in warm waters and find their optimum temperature between 60° and 70°. If it be desired to establish self-perpetuating beds it is important that the temperature should reach an even higher point during the summer in order to stimulate natural reproduction. Being naturally brackish water animals oysters do not thrive in water of full sea salinity and become of very poor quality when the percentage of salts falls too low. In commercial quantities they inhabit water of densities between about 1.008 and 1.022. It is important to so locate beds that they shall be free from inundating freshets. While oysters are generally planted in shallow bays and coves at depths of from one to five or six fathoms luxuriant natural beds are found from above low water to a depth of 20 fathoms, and in Long Island Sound planting is practised to 15 fathoms.

The food of oysters consists of a great variety of minute animals and plants, protozoans, the eggs and swimming larvæ of many kinds of sponges, worms and mollusks, including their own, the spores of algæ and especially the minute plants known as diatoms. The latter live in enormous numbers on the surface of the mud in shallow bays, and during warm weather multiply with great rapidity. As they constitute the bulk of the oyster's food the importance of determining their abundance in advance is self-evident. The other organisms chiefly belong to the associations that become established on the oyster beds and their occurrence need not be so carefully predetermined. It is possible to establish highly successful beds at some distance from the diatom garden if strong tidal or other currents pass from the latter to the former. The existence of such currents is beneficial in many other ways also than as food carriers. They sweep the beds clean of sediment, ensure a ready supply of oxygen and increase the fecundity of the beds by bringing the ova and spermatozoa in contact and by carrying the young swimming spat to suitable places of attachment.

All of these conditions having been satisfactorily determined and the site for a bed located the planter first marks its boundaries by stakes or buoys. The bottom is then smoothed and cleared of snags and débris either at low tide or by means of tongs or dredges according to the depth. If the bottom is covered by more than an inch or two of mud it is prepared by strewing it with an even layer of shells, gravel, slag, cinders or similar material. These furnish a foundation, and, if the bed be suitably related to a spawning ground, serve at the same time as a «clutch» on which the spat will settle. In this case nothing further need be done but to await developments and care for and protect the beds. But if this is not the case young or «seed» oysters must be provided. These are usually from one to one and one-half inches in diameter and are obtained either by dredging the gravel and shells from natural beds or by spreading on the bottom suitable shells or other «clutch» to collect the spat; when they are raised and spread over the prepared bottom, usually to the extent of 300 to 600 bushels per acre. While very soft bottoms are usually unfavorable for planting they may sometimes be prepared by covering with a layer of brush and it is probable that either by this method or by building open platforms many such places will be utilized in the future. From one to four years, depending on the richness of the food supply, are required to mature sea oysters. In order to make a portion of the supply available each year the bed should be staked off into three or four sections, only one of which is dredged annually, the others remaining undisturbed to collect spat and mature their growth.

Among the teeming life of the oyster beds are found many plants and animals which are more or less destructive, especially to the young and thin-shelled oysters. Strong growths of eel grass and algæ, as well as boring sponges and similar animals, should be kept in check by mowing or dredged and removed when necessary. A more serious pest is the gastropod mollusk (*Urosalpinx*), which perforates the shells and destroys young oysters, especially southward; starfishes, which often sweep over the Long Island Sound beds in such vast armies that all but the very largest oysters are devoured; and drumfish and stingrays, the former of which creates great havoc in New Jersey, the latter in California. Strong stockades of stakes are a sufficient bar to the larger fishes. Prompt and energetic use of great mops in which they become entangled will greatly reduce the number of starfishes, which can be used as fertilizers on the land. Large numbers of drills may be captured by the use of an ingenious box dredge provided with a screen cover which excludes the oysters while the drills drop through its meshes into the interior. Certain sponges and annelids also injure the oysters.

For a few weeks previous to marketing many oyster farmers transfer a portion of their crop from the beds in deeper waters to warm shallows, where the greater abundance of food causes them to fatten and improve in flavor. Such oysters are highly esteemed and have an enhanced value. This process must not be confused with «plumping,» which, though also known as fattening, consists simply in changing the oysters to waters of a lower density for a few days. As a result they absorb water and become bloated. They gain nothing in nutrient value and deteriorate in flavor, but appearing plump and full find a ready sale at a higher price.

While the practicability of some forms of pond culture in the United States has received experimental demonstration and enormous possibilities for future extension of the oyster industry by this means are indicated, the demand has not yet led to the employment of the capital required for its development on a commercial scale. Important advantages of pond culture lie in the possibility of increasing fecundity by artificial propagation and more efficient collection of the spat, the control of the food supply and the exclusion of enemies. The immediate prospects are that the next practical step in the development of oyster culture in this country will be in the direction of raising in artificial enclosures seed oysters for planting beds on natural and prepared bottoms.

Cultural methods have attained a high degree of perfection in various European countries, especially in France and Holland, and in Japan. In France *O. edulis* and allied species are cultivated in oyster parks. The «spat» is collected on fagots of brush, tiles or other collectors placed in proximity to spawning beds. The «seed» oysters are then removed to partially enclosed growing-ponds admitting the tides through sluices and flood-gates. When fully grown they are fattened and flavored in small enclosed ponds or «*claires*. While in these their diet of diatoms gives them a green color that is no sign of inferior quality. While some of these refined methods will doubtless serve as the basis of a future oyster culture on parts of the Atlantic seaboard, the simpler Japanese methods seem better adapted to the culture of the oysters of our Pacific Coast. The oyster culture of Japan reaches its highest development in the Inland Sea and is concerned chiefly with *O. cucullata*. As in France, the exact methods employed differ greatly with the locality, but in general the farms are in shallow brackish waters, where the great tidal rise and fall leaves large areas exposed at low water. They are laid out with reference to the direction of the currents, topography of the bottom, etc., and each is enclosed by a bamboo fence or hedge. This area is then planted with bamboo stakes stuck into the ground and variously laid out in straight parallel fences with suitable alleys and aisles or in groups arranged in rows, circles, etc. These serve to collect the spat and to hold the growing oysters. In districts where growth ceases in two years two sets of fences arranged alternately are employed, one set being culled and rebuilt each year. In other districts the oysters are moved annually from shallow into deeper water until the end of the third or fourth year, the shallows near the shore being employed for spat collection, the moderate depths for growing bottoms and the deeper waters of each farm for fattening.

Oysters appear under certain conditions to be poisonous, whether on account of ptomaines resulting from decay or from pollution or otherwise. One of the forms of greenness to which oysters are subject is due to the presence of copper, and appears to be damaging to the quality of the oyster, if not actually poisonous.

Recent available statistics of oyster production are here tabulated:

	United States		Atlantic Coast		Gulf Coast		Pacific Coast	
	Pounds	Value	Pounds	Value	Pounds	Value	Pounds	Value
Oysters, market, from public areas..........	103,641,000	$4,416,000	72,413,000	$3,303,000	31,225,000	$1,112,000	2,300	$800
Oysters, market, from private areas.........	74,652,000	8,305,000	64,642,000	7,239,000	7,956,000	381,000	2,055,000	686,000
Oysters, seed, from public areas................	26,960,000	1,035,000	22,436,000	948,000	4,522,000	87,000	1,800	200
Oysters, seed, from private areas.........	28,056,000	1,957,000	27,252,000	1,944,000	700,000	6,200	104,000	6,500
Total oysters.......	233,309,000	$15,713,000	186,743,000	$13,434,000	44,403,000	$1,586,200	2,163,100	$693,500

About five-eighths of these come from artificial beds.

In the United States oysters are collected from the beds, whether natural or artificial, in two ways. In the shallower waters they are taken by means of oyster-tongs, which are like two long-tined rakes, hinged so as to open and close like shears. In deeper water (down to 15 or 20 fathoms) recourse is had to the dredge worked by steam or sail boats. This is a rectangular iron frame-work, about four feet across, with sharp edges, or with long teeth upon one side, while attached to the other is a large open-work bag of cord or iron. This dredge is dragged over the bottom, the teeth or sharp edges tearing the oysters loose, when they are caught in the bag and brought to the surface. See also PEARL.

Bibliography.— The importance of the oyster industry has led to the development of an extensive literature to which the following, chiefly government publications, are introductory: Brooks, W. K., ‘The Oyster’ (Baltimore 1915); Brooks et al., ‘Report of the Oyster Commission of the State of Maryland’ (Annapolis 1884); Dean, ‘Present Methods of Oyster-culture in France’ (Bull. U. S. Fish C. 1890); Dean, ‘European Methods of Oyster-culture’ (ib. 1891); Dean, ‘Japanese Oyster-culture’ (ib. 1903); Huxley, ‘Oyster Industry of England’ (*English Illustrated Magazine*, Vol. I); Ingersoll, ‘The Oyster Industry’ (Tenth Census Report, 1881); Kellogg, J. L., ‘Shell-fish Industries’ (New York 1910); Moore, ‘Manual of Fish-culture’ (Washington 1897); Moore, ‘Report on Oyster Beds of Louisiana’ (Rep. U. S. Fish Com., 1899); Ryder, ‘Principles of a Rational System of Oyster Culture’ (ib. 1886). Numerous additional biological, cultural and statistical papers may be found in the publications of the United States Bureau of Fisheries, including in the earlier volumes some translations of important papers by European authorities. The commissions of Maryland, New Jersey, etc., have also issued important reports, generally of more local interest.

OZÆNA, a discharge of fetid, purulent or sanious matter from the nostrils. It is a symptom rather than a disease, and may arise from ulceration of the membrane lining the nostrils, or from caries of the adjacent bones.

OZANAM, ō'zą'nän', **Frederick,** French author, professor and philanthropist: b. Milan, 23 April 1813; d. Marseilles, France, 8 Sept. 1853. He was the second son of an eminent physician, Antoine Ozanam, a descendant of a long line of scholars and scientists and of Jewish extraction. Soon after the birth of Frederick, the family returned to their native city, Lyons. Great care was exercised in the early education of the boy. The teacher who exerted the most influence over young Ozanam was Abbé Noirot. He was the youngest of 130 pupils; but nearly all the time he was a pupil in this famous school he led his class. He was well versed in the grammar and literature of English, German, Hebrew and Sanscrit, and was one of the eminent French scholars of the time. At an early age his writings attracted the attention of such men as Lamartine and his associates. After finishing his college course he began the study of law. It was while a law student in Paris that he formed the acquaintance of and became friends with Marie Ampère, the mathematician; Chateaubriand (q.v.); Lacordaire (q.v.), and a number of the writers and professional men of France.

His first public work was an attack on the doctrines advanced by the Saint Simonians. In reply to Ozanam's attack on their doctrines, the Saint Simonians accused the followers of Ozanam of doing nothing but advance theories. In May 1833, Ozanam and a few chosen companions held a meeting to consider ways and means of combating the Saint Simonians. At the suggestion of Ozanam it was resolved that they should unite in giving personal service «to God in the persons of the poor, whom they were to visit at their own dwellings and assist by every means in their power.» This meeting was really the beginning of the Society of Saint Vincent de Paul (q.v.). The members of this new organization were to do more than give alms; they were to place their intelligence, their education, their special knowledge of law and science, and their general knowledge of life, at the disposal of the poor.

Ozanam is regarded as the founder of the now great Society of Saint Vincent de Paul; but he always, in his humility, repudiated the title of founder. «We were eight,» he would say. He was one of the first, if not the first, to introduce Dante to the French people. His thesis on Dante when, in 1838, he went up for the degree of doctor of laws, electrified Paris. His audience wept, applauded and at the close rose *en masse* and expressed their appreciation. He was only 26 years of age when he was appointed to the municipal chair of law in Lyons. Later he accepted the chair of foreign literature at the Sorbonne. When he began his work at the Sorbonne he was 27 years of age and had just been married. His work here showed that he was a master among instructors, a leader among students of literature; but his great aim was «to make men of his pupils,» to impart to them manliness, vigor and love of work.

In 1843 he was one of the group who founded the literary association called the «Cercle Catholique.» Some of those interested in this movement were Lacordaire, Montalembert (q.v.), De Ravignan and Bautain. Ozanam was made president. His speech on the literary duties of Christians was one of the great attractions of the first year. He shone as a scholar and an orator, defending the Catholic Church against its opponents with great vigor, and he was recognized as a most industrious student; but he is best known to-day for his personal service to the poor and the ignorant and his advocacy of the work of the Society of Saint Vincent de Paul. His best-known books are ‘Les Poetes Franciscains’; ‘Dante's Divina Commedia’ ‘Les Germains.’ Consult O'Meara, ‘Life and Works of Ozanam’; ‘Letters of Ozanam.’

OZARK (ō-zärk') **MOUNTAINS,** a plateau region, from 1,200 to 1,800 feet above the sea-level, extending with gradual upliftings from the southern part of Illinois into Missouri, then sloping down enters Arkansas and Indian Territory and extends into Kansas. The highest point is Pilot Knob, in Iron County, Mo. The hills are in separate peaks or knobs, and not in continuous ridges. The irregularities which show mountain-making processes as existing are not visible here; the Ozark Mountains or Ozark Plateau belong with the oldest mountain regions of the world, and denudation is slowly and surely removing the last remnants of once lofty mountains. A small area of Pre-Cambrian rocks is exposed in the Saint Francois Mountains; the remainder of the plateau consists of rocks of Cambrian and Ordovician Age. The region was probably peneplained in Tertiary time, and has since been uplifted and dissected. On the southern slope are large forests.

OZOCERITE, ō'zō-sē'rīt, a mixture of the solid hydrocarbons left behind by the evaporation of petroleum *in situ*. It is waxlike, occasionally with a fibrous structure, and usually consists of an aggregate of minute doubly-refracting needles. Fracture often conchoidal. Ozocerite varies in consistency from that of soft putty to that of beeswax. The melting point varies from 50° to 90° C., and attains the maximum value in the best material. The specific gravity is 0.9–0.98. The color by reflection is greenish or yellowish brown, green or black; by transmitted light a thin lamina appears brown or reddish brown. Ozocerite is often found together with petroleum, and as an impregnation or in fissures in sedimentary rocks. It is found in largest quantities in Gallicia, Rumania, Baku and Utah. The Gallician mines were formerly worked by hand, but now employ electrical power. The methods of extracting the wax vary from hand-picking to the use of boiling water. The resulting wax is refined by sulphuric acid and charcoal, and is known as ceresine. It is used to adulterate beeswax; to make candles for hot countries, oils, and a substance like vaseline, as an electrical insulator, and to polish the heels and soles of shoes. The annual production of ozocerite in Gallicia is about 2,650 tons. See ELATERITE; HATCHETTITE.

OZONE. See LIQUEFIED AND COMPRESSED GASES; ALLOTROPY.

P

P the sixteenth letter of the English and various other alphabets, is the sharp labial consonant pronounced when, the lips being closely compressed, they are separate by a forcible emission of the breath. Like *k* and *t*, it is a pure mute or surd, involving no action of the vocal chords: it differs from *b* in that *b* is sonant: with the same compression of the lips as in *p*, the effort to pronounce *b* involves the vibration of the vocal cords. The form of this letter, P, comes from the Latin alphabet: the same speech element is called *pi* in Greek and its form is Γ, *η*. while in the Greek alphabet our character P is called *rho*, equivalent to *r*. In early Phœnician writing the element *p* was represented by a vertical stroke curved or crooked to the left at the top(ᒣ): this form was also used in early Greek, but with crook directed to the right, (ᒥ): afterward the crook was made angular, (Γ), and finally the two downward strokes were made of one length (π). In early Latin the *p* had the form (ᒥ) which finally became P. The surd labial *p* is freely interchanged with *b*, *f* and *v*, for they are all of the class of labials and dentilabials.

Languages springing from a common original differ from one another in the preference they show for *p*, *b*, *f* or *v*. The English language has very few words of Germanic origin beginning with *p*: such words in English are nearly all of Latin, Greek or Celtic origin. Latin *p* by Grimm's *law* (q.v.) corresponds to English *f*, as *pater* (*father*). English *p* corresponds to Latin *b*, as *lip*, cognate with *labium*. In German very many words of Latin origin, as *palatinatus* (from *palatium*), *papa*, *palus* (stake), *persona* (parson), *pavo* (peafowl), *præbenda* (prabend), *piper* (pepper) become *pfalz*, *pfaffe*, *pfal*, *pfarrer*, *pfau*, *pfründe*, *pfeffer*, etc. The digraph *ph* was originally used by the Latins to represent the sound of the Greek letter *phi* (Φ, ϕ), which must have been different from the sound of the Latin letter *f*; else the Greek words *philosophia*, *pharmakon*, *phonaskos*, etc., would have been written *filosofia*, *farmacum*, *fonascus*, as the modern Italians write everywhere *f* for *ph* — *filosofia*, *fisica*, *Filomena*, etc. There are no native English words beginning with *p* followed by *n*, *s* or *t*; but there are many such words of Greek origin: in those words the *p* is silent. The *p* between *m* and *t* in *attempt*, *contempt*, etc., is *introduced* to facilitate the utterance of the *m*: but in such words as *exemption* (exemshun), *redemption* (redemshun), etc., there is no need of this mediating *p* and it is silent in correct pronunciation. See ALPHABET; PHONETICS.

PABRIANICE, pä'byą-nyē-tsĕ, Poland, a manufacturing town in the district of Piotrkow, 10 miles southwest of Lodz, with which it has communication by means of an electric railway. Paper and agricultural implements are manufactured and there are also textile mills. Pop. 39,000.

PACA, pä'ką, **William**, signer of the Declaration of Independence: b. Wye Hall, Hartford County, Md., 31 Oct. 1740; d. there, 1799. He studied at Philadelphia College, where he was graduated in 1758, and in the Middle Temple in London; practised law in Annapolis; became a patriot leader; was a member of the legislature 1771–74, of the committee of correspondence 1774, of the Continental Congress 1774–79, and of the State senate 1777–79. His career as judge began in 1778, when he became chief judge of the Maryland Superior Court; from 1780 to 1782 he was chief judge of the Court of Appeals for Admiralty and Prize Cases. In 1782–86 he was governor of the State; in 1788 was a member of the State convention which ratified the Federal Constitution; and for the last 10 years of his life was United States district judge. His wealth and influence had been lavishly given to the Revolutionary cause, and he more than any one man perhaps overcame the opposition in Maryland to that cause.

PACA, a large agouti-like animal (*Cœlogenys paca*) of eastern South America, robust in form, with a broad, swollen head, caused by the great expansion of the zygomatic arches, and large eyes and ears. It is about two feet long and a foot tall; the tail is a mere rudiment and the color brown, marked with rows of oblong whitish spots. It lives near water in which it is much at home and digs shallow burrows in which a single young one is produced annually. It remains hidden by day and seeks its plant-food by night, often making destructive forays upon plantations, especially of sugarcane. The flesh is edible and the hide is useful for leather. Another less common species is recorded.

PACAY, pą-kā', a Peruvian leguminous tree (*Prosopis juliflora*) related to the mesquite. The pure white, flaky matter in which the seeds are embedded is used as food, and the pods, which are nearly two feet long, serve for feeding cattle. A gum, called mezquit gum, is also obtained from the plant. The name pacay is also applied to *Inga Feuilli*, another Peruvian leguminous plant.

PACCANARISTS, a religious congregation of the Catholic Church, founded in Rome, in 1797, under the name of Regular Clergy of the Faith of Jesus, by Nicolao Paccanari, by whose name they came to be known popularly. The founder intended the congregation to carry on the work of the Jesuits, just then suppressed, but upon the re-establishment of the latter in 1814 the Paccanarists were merged with them.

PACCARITAMBO, päk-kä-rē-tăm'bō, or **PACCARITAMPU**, Peruvian cave south of Cuzco, on the Vilcamija River, reputed among the Incas as the place where Manco Capa and his brothers appeared first on earth, and styled «House of Dawn,» in Quicha Paccaritampu.

The same idea is prevalent in numerous mythologies of the American Indians. The sun came out of a cave in the morning and went into one in the evening. As the Peruvian upper classes of pre-Columbian days claimed that they were the children or descendants of the sun, they designated their starting place as the «House of the Dawn.» This was symbolical and equivalent to saying that they came from the realms of the sun. The place from which the sun people came into Peru, according to the commonly accepted tradition, also became commonly known as the Paccaritampu or «House of the Dawn» or beginning.

PACCHIAROTO, pak-kē-ä-rō'tē, **Jacopo**, Italian painter: b. Sienna, 1474; d. France, 1540. When a boy he showed a taste for devotional art and was placed in the studio of Bernardino Fungai, a Siennese artist of contemporary fame. In 1535 he headed a conspiracy against the government of the city and after concealing himself in a grove fled for his life to France, where he worked under Rosso, the famous Italian painter, sculptor and architect, who had been invited to court by Francis I. While his main works in fresco and oil are at Sienna, his ‹Saint Francis of Assisi› and ‹Madonna and Child› in the Munich Pinakothek are among the gems of that collection. His style shows the influence of Perugino, and possibly of Raphael (q.v.). According to some authorities, the better of the works attributed to Pacchiaroto are really due to one Girolamo del Pacchia, while Pacchiaroto's work was at best mediocre.

PACCIOLI, pạ-chō'lē, **PACIOLI**, or **PACIUOLO**, **Luca de Borgo**, Italian mathematician: b. Borgo San Sepolcro, Tuscany, about 1440; d. about 1515. He traveled in the East in his youth and joined the Franciscan Order. He became famous as a teacher of mathematics in Florence, Rome and Venice. He wrote ‹Summa de Arithmetica, Geometria, Proportione et Proportionalita› (1494; 2d ed., 1523), which covered completely the mathematical field of his day and was the first great work on mathematics after the Latin Euclid of 1482. Fra Luca is considered the inventor of bookkeeping on modern or quasi-modern lines.

PACE, a measure of length, used as a unit for long distances. The Latin pace was measured from the mark of the heel of one foot to the heel of the same foot when it next touched the ground, thus stretching over two steps; while the English pace is measured from heel to heel in a single step. The Latin pace was somewhat less than five feet; the American military pace at the ordinary marching rate is two and one-half feet and at double-quick time three feet. The pace, measured separately for each individual, is the usual working unit in the construction of military maps in the field.

PACER. See HORSE, THE; HORSE-RACING.

PACHACAMAC, päch-ä-kä'mäk, ruined city and temple in the district of the same name in Peru. The village now occupying the site is called La Mamacoma and is the terminus of a railway from Lima, 20 miles to the northwest, and is situated near the Rio de Lurin. The ancient city, a sacred city and quasi-Mecca of both the Incas and the earlier Yuncas, was devoted to Pachacamac, the supreme god and creator of all in the Yunca theogony, and in the time of the Incas to a temple of the sun. The outlines of the old city are clearly visible; it had broad, regular streets and its entire site, a lofty hill, projecting out to sea, was elaborately terraced. On its top was the temple of Pachacamac, about 200 yards long and 150 wide. A cemetery surrounds this temple and is very rich in remains of the pre-Incan civilization, especially household utensils, which were buried with the flexed corpses. The Inca convent on lower ground is an adobe building, 116 yards long and 67 wide and contains 18 cells. The remains of tiny huts at the foot of the hill probably point to pilgrimages to these shrines, being no doubt inns for the entertainments of the pious visitor. Pizarro sacked the shrine in 1523, destroyed a wooden idol and it is said carried away 1,700 pounds of gold and 1,600 of silver. Consult Squier, ‹Peru› (1853); Uhle, M., ‹Pachacamac› (Philadelphia 1903); Wiener, ‹Pérou et Bolivie› (1880).

The district of Pachacamac is an administrative division of the province and department of Lima, with about 1,300 inhabitants. The same name is borne by an island off the coast of Peru near Lurin.

PACHECO, **Francisco**, frăn-thēs'kō pä-chā'kō, Spanish painter and writer on art: b. Seville, 1571; d. there, 1654. As a theorist in the art of painting Pacheco occupies a unique position in the history of the Seville school. His pictures are elaborate in their skilful embodiment of the principles he expounded in his ‹Arte de la Pintura› (the Art of Painting). His treatise, however, did much for art in Spain, and he was the master of both Alonzo Cani and Velasquez, the latter of whom became his son-in-law. In his ‹Last Judgment› (painted for the nunnery of Saint Isabel) he introduced his own portrait, and ambitious and learned as many of his pictures are his small portraits, some of them in crayon, are among the best of his works. Good examples are to be seen in the two churches at Alcala de Guadairo near Seville and in the Madrid picture-gallery.

PACHMANN, päh'măn, **Vladimir de**, Russian pianist: b. Odessa, 27 July 1848. He studied music with his father, an amateur violinist and with Dachs at the Vienna Conservatory; made his first appearance in 1869; after eight years of retirement made his first tour; again retired for two years; in 1882–83 played successfully in Vienna, Paris and London; came to the United States in 1890; and toured in 1899 and 1900.

PACHOMIUS, pa-kō'mi-ŭs, **Saint**, Egyptian ascetic of the 4th century: b. Thebaid, about 292; d. Proii, Egyptian Thebaid, about 348. In early life he was drafted as a conscript in the army of Maximin and at Thebes met Christians, whose teaching so interested him that on the conclusion of the campaign of Maximin against Constantine and Licinius he was baptized and embraced the life of an anchorite. His guide in his choice was Palemon, who accompanied him to Tabenna, an island in the Nile, where they took up their residence. In 326 he founded the first monastic community and he is spoken of by the learned Tillemont as «the institutor not only of certain monasteries, but of the conventual life itself, and of the holy communities of men devoted to religious life.» His sister is said to have founded the first convent. The movement spread rapidly and according to Palladius (q.v.) at their death their monastery and convent contained 7,000 inhabitants. (See MONACHISM). Consult Amehneau, ‘Etude historique sur Saint Pakhôme et le cenobitisme primitif dans la Haute Egypte’ (Paris 1887); Grützmacher, ‘Pochomius und das älteste Klosterleben’ (Freiburg 1896); Ladewze, P., ‘Le cenobitisme pakhomien’ (Lovain 1898).

PACHUCA, pā-choo'kä, Mexico, capital of the state of Hidalgo, 68 miles by railway northeast from the City of Mexico; elevation about 8,000 feet above the sea. Three railways — the Hidalgo and branches of the Mexican and Mexican Central — supply transportation facilities. The Sierra Madre Oriental rising on three sides form an ampitheatre in which the city is situated and from which it looks out toward the southwest upon a rich and highly cultivated plain. These mountains are honeycombed with producing mines down to the very door of the city itself, within the boundaries of which are several important establishments for treating ores, some of which have been in operation since the early days of mining in this district. The mountains behind the city form the northeast boundary of the valley of Mexico and within their shadows is produced almost or quite one-third in value of the annual output of Mexico. The city is essentially a mining community and is not especially noted for any other industry. It has a strong financial institution — the Bank of Hidalgo — with a capital of $1,000,000, a branch of the National Bank and an agency of the Bank of London and Mexico. There are two public libraries, containing together over 5,000 volumes, and a number of churches and schools. Bartolome de Medina, who in 1557 discovered the patio process of amalgamating ores, which is still largely in use by Mexican miners, lived in Pachuca. Pop. about 37,000.

PACHYDERMATA, păk'ĭ-dẽr'mạ-tạ, the name formerly applied to a division or order of mammalia including the elephants, tapirs, hippopotamus, rhinoceros, swine and hyrax — all of which forms were distinguished by their thick skin, by their non-ruminant habits and by their possessing more than one hoof on each leg. This classification has, however, given place to a more scientific and natural arrangement, in which the several forms are placed according to fundamental structural affinities. Thus the elephants form a distinct order, the *Proboscidea*. The rhinoceros and tapirs are included in the division *Perissodactyla* of the ungulate order; the hippopotamus and swine are arranged in the section *Artiodactyla* of the same order; while the hyrax has a separate order — *Hyracoidea* — to itself. See UNGULATA.

PACIFIC OCEAN, also formerly called the SOUTH SEA, the largest of the five great basins of the hydrosphere, extending for 133° of latitude and 180° of longitude, between the west coast of the North and South American continents and the east coast of Asia and Australia. It exceeds in compass the whole of the four continents taken together, and occupies more than a third part of the earth's area. On the west it borders on the Indian Ocean, on the north it communicates with the Arctic Ocean by Bering Strait, on the south it is bounded by the Antarctic Ocean and on the east it joins the Atlantic at Cape Horn. Within this enormous circumference it includes the numerous islands composing the groups of Australasia, Polynesia, Melanesia and Micronesia, the islands on the west coast of America and those on the east and south coasts of Asia. The Pacific Ocean is divided into — (1) the north Pacific, bounded on the south by the tropic of Cancer, and comprising in the north and west Bering Sea and the Sea of Okhotsk, the Japanese Sea, the East or North China Sea and the Yellow Sea, and in the east the Gulf of California; (2) the central Pacific, stretching between the tropics, and comprehending the greater part of the numerous and beautiful insular groups known by the collective name of Polynesia; and (3) the southern Pacific, or South Sea proper, extending from the tropic of Capricorn to the Antarctic Ocean, and not diversified by many islands. The Pacific Ocean receives most of its affluents from the Asiatic Continent, the principal rivers being the Amur, Hoang-ho and Yang-tse-kiang; while from South America, owing to the proximity of the Cordilleras to the coast, it receives no stream of any consequence, and from North America only the Yukon, Columbia and the Rio Colorado.

The islands of this ocean are so numerous that it is difficult to give an enumeration of them, even in groups. Commencing on the American coast south of the Strait of Magellan, and proceeding north, an uninterrupted chain lines the shores of Chile and terminates in the large island of Chiloe. Many islets occur along the stretch of coast farther northward, and at the equator, about 700 miles west from the mainland, is the interesting Galapagos group. Northward along the coasts of Mexico and the United States are the Revillagigedo, Alijos, Guadalupe and several other small groups, while lining the coasts of Canada and Alaska is a chain of large islands, including among others those of Vancouver and Queen Charlotte. Turning west the Kodiak Archipelago lies at some distance off the east coast of Alaska, and the still larger chain of the Aleutian Islands, curving southwest from the extremity of that peninsula and terminating the groups of the Pacific, so far as they belong to the American continent. On the opposite continent of Asia the islands commence with the Kurile chain, stretching southwest from the extremity of the Peninsula of Kamchatka and afterward continued in the same direction by the far more important islands of Japan, the Philippines and other large islands of the Indian Archipelago. In the south region of the Pacific, beyond the tropic of Capricorn, the islands are few in number, but include the important group of New Zealand. Between the tropics the principal groups are, north of the equator, the Hawaiian, Ladrone or Mariana and Caroline Islands; and south of the equator, the Marquesas, Low Archipelago, Society, Friendly, Fiji, New Caledonia, New Hebrides and Solomon groups.

The bed of the Pacific is composed largely of red clay, with extensive sections of blue and coral muds, Globigerina, Radiolarian, Diatom and Pteropod oozes, and in the eastern portion and south of Australia and New Zealand is fairly regular, ranging from 1,000 to 2,000 fathoms in depth. In the north, northwest and the south, east of New Zealand, are extensive deeps, the Tuscarora deep east of Kamchatka, the Kurile Islands and Japan, having a depth greater than 4,000 fathoms, the Aldrich deep east of New Zealand, over 5,100 fathoms. Between Guam and Midway islands (q.v.) the United States telegraph ship *Nero* in 1900 sounded a depth of 5,269 fathoms. The Fiji, Ellice, Solomon and Tonga islands lie on a plateau southeast of New Guinea, and New Zealand is, as it were, a peninsula of this plateau. The slope of the Asiatic continental shelf is much less than that of America. The mean depth of the Pacific is about 2,300 fathoms. See OCEAN.

The general laws regulating winds, tides and currents suffer fewer modifications in the Pacific than in narrow seas. The tidal wave, commencing at the equator, diverges from it toward the poles and, proceeding with great velocity and without an obstruction, is scarcely perceptible among the central islands of the Pacific. Hence in the Low Archipelago, at Bow Island and Tahiti, the rise is only one foot and at the Sandwich Islands two feet. It is only when, by the proximity of a mainland diminishing the depth of the water, or by any similar cause the natural course of the wave is changed, or obstacles to its progress are interposed, that an accumulation takes place, and high tides are formed. In the Pacific, however, these never attain the maximum heights for which some parts of the Atlantic and Indian oceans are celebrated. In the solitary instance of Cook's Inlet, Alaska Territory, the rise is as high as 28 feet; but on all the west coast of America it is usually below 10 feet, and only in the Bay of Panama varies from 13 feet to 15 feet.

The prevailing winds of the Pacific, like those of other great seas, are divided into regular or trade winds and variables. The trade winds of the Pacific are not so regular in their limits as those of the Atlantic, and this irregularity extends over a much wider region in the case of the southeast trade wind than in the case of the northeast. The cause of this is the greater number of islands in the South Pacific Ocean, which, especially in the hot season, disturb the uniformity of atmospheric pressure by local condensations. The northeast trade wind remains the whole year through within the northern hemisphere. In the middle of summer (about July) the zone within which it blows extends from about the Mariana or Ladrone islands, in 146° east longitude, to near the coast of North America (Lower California), and its southern limit begins to the south of the islands mentioned, in about lat. 13° N., gradually descends toward the east to about 8° N., and then rapidly rises again to about 20° N., near long. 115° W. In winter (about January) this zone extends from Borneo and the Philippine Islands to the American coast; and its southern limit, beginning about the northeast of Borneo, keeps between 2° and 4° N. latitude until about long. 170° W., when it gradually rises to about 10° N. lat., at about 100° W. long. The southeast trade wind, on the other hand, advances beyond the equator, both in summer and winter, still preserving its original direction; in summer (July) to about 7° or 8° N. lat., and in winter (January) to about 5° N. lat., at 160° W. long. In July the zone of this trade wind extends from New Guinea and Australia to the neighborhood of the South American coast; and its southern limit, beginning off the coast of Australia, about lat. 24° S., gradually rises to about lat. 16° S., at long. 130° W., and then sinks again to about lat. 24° S. off the coast of South America. In January, on the other hand, the western limit of the southeast trade wind is about long. 175° W.; and its southern limit, commencing there about the equator, sinks gradually till it touches the Marquesas Islands, and then more rapidly till it reaches about 33° S. lat. off the South American coast. In the region lying to the west of this zone, and stretching from New Guinea and the Solomon Islands southeastward, there are no regular winds. West winds, accompanied by rains, here alternate with calms. Sometimes also irregular warm, moist winds reach this region from the north, but the regular northeast trade wind never visits it. The zones of the two trade winds are separated by regions of calms and of light winds, the limits of which vary of course with the varying limits of these zones. In the Chinese seas the terrible typhoon occasionally rages and may occur at any season of the year.

The following table exhibits the mean velocity of the currents of the Pacific Ocean in 24 hours:

SOUTH PACIFIC OCEAN.

Southern equatorial current	24 miles.
Cross current	20 "
Current of Cape Horn	18 "
Humboldt's current	15 "
Current of Mentor	16 "
General current of Australia	12 "
Periodical currents of Australia	6 miles near the land. 16 miles at sea.

NORTH PACIFIC OCEAN.

Northern equatorial current	30 miles.
Equatorial counter current	15 "
Monsoon current of the Carolines	3 "
Japan current	31 "
Current of N. W. coast of America	16 "
Current of Kamchatka	8
Bering's current	14 "

The periodical current of the west coast of Mexico, occasioned by the monsoons of this coast, resembles them in its alternations. It extends from Cape Corrientes to the Cocos Islands, preserving a nearly uniform breadth of 350 miles. It was first noticed by Humboldt. See OCEAN CURRENTS.

The Portuguese were the first Europeans who entered the Pacific, which they did from the east. Balboa, in 1513, discovered it from the summit of the mountains which traverse the Isthmus of Darien. Magellan sailed across it from east to west in 1520–21. Drake, Tasman, Bering, Anson, Byron, Bougainville, Cook, Vancouver, Lapérouse and others traversed it in different directions in the 17th and 18th centuries. Consult Bancroft, H. H., 'New Pacific' (San Francisco 1912); Brigham, W. T., 'Index to the Islands of the Pacific' (Honolulu 1900); Burney, 'Chronological History of

Discoveries in the South Sea'; Enock, C. R., 'Secret of the Pacific' (New York 1912); Flint, J. M., 'Contributions to the Oceanography of the Pacific' (Washington 1905); Fox, F., 'Problems of the Pacific' (Boston 1913); Colquhoun, 'Mastery of the Pacific'; Thomson and Murray, 'The Challenger Expedition' (1880–95).

PACING. See Horse-racing; Sports.

PACINI, pạ-chē'nē, **Filippo,** Italian anatomist: b. Pistoia, 1812; d. 1883. He was educated at Florence and at Pisa, and in due time was appointed to the chair of anatomy at the University of Florence. In 1835 Pacini rediscovered the peripheral nerve terminations described by Vater in 1730. He wrote extensively on anatomy, pathology and therapeutics. His most important work is one on artificial respiration, which described the methods employed by him in resuscitating new-born children.

PACINI, Giovanni, Italian composer: b. Catania, 1796; d. 1867. He studied under Marchesi and Furlanetto and in 1813 brought out his first operatic effort, 'Annetta e Lucindo.' By 1834 he had added 41 operas to his list and was the most successful composer in Italy in his time. He established a school of music at Viareggio and pupils from all over the world flocked thither to receive instruction. He again began to compose after 1840 and added about 50 more operas to his list, including 'Medea' (1843); 'Saffo' and 'La Regina di Cipro' (1846).

PACINIAN CORPUSCLES, or **PACINIAN BODIES** (also called corpuscles of Vater), elliptical concentrically striated bodies of cellular tissue, capillary vessels, a watery fluid, granular material and epithelioid cells; first described by Filippo Pacini in 1840. Into each corpuscle runs the axis-cylinder of a nerve (probably covered by the sheath of Schwann), terminating in a bulbous enlargement, or branching so that each nerve-fibral has a similar terminal knob. These corpuscles are the «peripheral end-organs» of certain sensory nerves and in the human being are found chiefly in the subcutaneous tissue of the palms of the hands and the soles of the feet, but have been found also in the genital organs, the nipples and other portions of the body. They are found in lizards, snakes, birds and mammals. They are tactile organs.

PACINOLO, PACCIOLI, or **PACIMOLO** (Lucas di Borgo), an Italian mathematician: b. Tuscany, c. 1450; d. c. 1510. He was a Franciscan monk and taught mathematics at Florence, Venice, Padua, Naples and Rome. His chief work, 'Summa de Aritmetica, Geometria, Proportione et Proportionalita' (1494), is important as being the first treatise on mathematics ever printed, and as embodying the results of mathematical research up to that time. A treatise on bookkeeping (published 1495) is also attributed to Pacinolo. See Finger Notation.

PACINOTTI, pä'chē-nŏt'tē, **Antonio,** Italian physicist: b. Pisa, 1841; d. 1912. He received his education at the University of Pisa, where he was professor for two years. In 1864 he removed to Bologna and in 1873 to the University of Cagliari. After 1882 he was again at Pisa. In 1860 he invented a dynamo with a special type of ring armature windings.

PACIUS, pä'sē-ûs, **Friedrich,** Finnish composer and violinist: b. Hamburg, Germany, 1809; d. 1891. His violin instruction was received from Spohr. In 1834 he settled in Helsingfors as teacher of music at the university. He is the author of the national songs 'Vartland,' 'Suomis Sang,' 'Soldatgossen'; the great operas, 'Kung Karls Jakt' and 'Lorelen' and the operetta, 'Prinsessan of Cypern.' Pacius was one of the greatest performers of his time on the violin.

PACKARD, päk'ạrd, **Alpheus Spring,** American educator: b. 1798; d. 1884. He was educated at Bowdoin College; was tutor there in 1819–24 and from 1824 to 1865 held the professorship of Greek and Latin languages and literatures. In 1869 Dr. Packard was appointed Collins professor of natural and revealed religion and also librarian. In 1882–84 he was acting president of Bowdoin. With Cleaveland he wrote 'The History of Bowdoin College, with Biographical Sketches of its Graduates' (1882). He wrote many articles for periodicals and edited 'Xenophon's Memorabilia Socratis,' with English notes (1839; 3d ed., 1843) and 'Works of the Rev. Jesse Appleton, with a Memoir' (1836–37).

PACKARD, Alpheus Spring, American zoologist: b. Brunswick, Me., 19 Feb. 1839; d. Providence, R. I., 14 Feb. 1905. He was graduated from Bowdoin in 1861 and the Maine Medical School in 1864; and was for three years a special student under Agassiz at the Lawrence Scientific School, Harvard University. From 1865–66 he was librarian and custodian of the Boston Society of Natural History; and from 1867–78 curator, and then director, of the Peabody Academy of Science. In 1871–73 he was State entomologist of Massachusetts; from 1877–82 he was a member of the United States Entomological Commission, participating in several scientific expeditions under their charge. In 1878 he became professor of zoology and geology at Brown University. His most important contributions to science have related to the classification and anatomy of the arthropoda, especially insects; he proposed a new classification of insects, and regrouping of the phyla of the arthropoda. As an evolutionist he is one of the founders of the Neo-Lamarckian school, to which he gave that name. His writings include 'Guide to the Study of Insects' (1869); 'The Mammoth Cave and its Inhabitants,' with F. W. Putnam (1872); 'Our Common Insects' (1873); 'Life History of Animals' (1876); 'Half Hours with Insects' (1877); 'Injurious Insects of the West' (1877); 'Development and Anatomy of Limulus Polyphemus' (1885); 'Entomology for Beginners' (1888); 'Textbook of Entomology' (1898); 'Lamarck, the Founder of Evolution, his Life and Work' (1901). He was one of the founders and for 20 years editor-in-chief of the *American Naturalist*.

PACKARD, John Hooker, American physician: b. Philadelphia, 15 Aug. 1832; d. 20 May 1907. He was graduated from the University of Pennsylvania in 1850; was acting surgeon in the United States army (1861–65); and surgeon to the Episcopal Hospital, Philadelphia (1863-84). He was also surgeon to two other hospitals in his native city, the Pennsylvania (1884-96) and the Woman's (1876-77). He published 'Minor Surgery'; 'Lectures on Inflammation'; 'Operative Surgery,' etc.

PACKARD, Joseph, American Protestant Episcopal clergyman: b. Wiscasset, Me., 1812; d. 1902. In 1831 he was graduated at Bowdoin College, in 1834-36 taught at Bristol College, Pennsylvania, and entered the ministry in 1837. In 1836-90 he held the chair of sacred literature in the Protestant Episcopal Theological Seminary of Virginia. He was professor emeritus after 1890; in 1872-85 served on the committee for revision of the Bible and was dean of the seminary for 15 years. He wrote 'Questions on the Gospels' (1855); commentary on Malachi in Lange's 'Commentary' (1874) and contributions to ecclesiastical periodicals. Consult his autobiography, 'Recollections of a Long Life' (Washington 1902).

PACKARD, Lewis Richard, American classical scholar: b. Philadelphia, Pa., 1836: d. 1884. In 1856 he was graduated at Yale and made post-graduate studies at Berlin. He became assistant professor of Greek language and literature at Yale in 1863 and after three years was made full professor. Mr. Packard was elected president of the American Philological Association in 1880 and in 1883 was made second director of the American School of Classical Studies at Athens. He was joint editor of the 'College Series of Greek Authors' (1885 et seq.). Consult his 'Studies in Greek Thought' (a collection of essays, 1886).

PACKARD, Silas Saddler, American educator: b. Cummington, Mass., 28 April 1826; d. New York, 10 Oct. 1898. He was educated at the Granville Academy, Ohio, and engaged in teaching at 17. He originated an admirable system of commercial training and in 1858 organized with Bryant and Stratton a business college in New York, which later became the Packard Commercial School. He founded the *Niagara River Pilot* in 1853 and edited it until 1856, and in 1868-70 published *Packard's Monthly.* He was president of the congress of business education at the World's Fair in 1893, and author of numerous textbooks, among which are 'The Packard Manual of Bookkeeping and Correspondence'; and 'The Packard Arithmetic.'

PACKARD, William Alfred, American classical scholar, son of A. S. Packard (1798-1884) and brother of A. S. Packard (1839-1905): b. Brunswick, Me., 1830; d. 1909. He was graduated at Bowdoin College in 1851 and in 1857-58 studied at the University of Göttingen, Germany. Subsequently he was appointed to the chair of Latin language and literature at Princeton University. He was a frequent contributor to the *Princeton Review* and the *Presbyterian Review.* He published an improved translation of Curtius' 'Griechische Geschichte.'

PACKER, păk'ėr, **Asa,** American capitalist: b. Groton, Conn., 20 Dec. 1806; d. Philadelphia, 17 May 1879. He worked at the trade of tanning, then as apprentice to a carpenter, went to Pennsylvania in 1822, and in 1823 took charge of a boat on the Lehigh Canal, and later connected himself with coal-mining and the transportation system between Pottsville, Pa., and New York as a builder of locks and boats for the canal system. In 1844 he was a member of the Pennsylvania legislature. The Lehigh Valley Railroad was projected by him, and was completed from Mauch Chunk to Easton in 1855. As a Democrat he served two terms in Congress (1853-57). Out of the great wealth which he acquired he made many generous public gifts, the founding and endowment of Lehigh University (q.v.) being his most conspicuous benefaction.

PACKER COLLEGIATE INSTITUTE, a secondary school for girls, located in Brooklyn, N. Y. It was chartered in 1853 and opened to students in November 1854; it stands on the site of the building of Brooklyn Female Academy (founded 1845), which was burned in December 1852. The work of the institute is in three departments, elementary, academic and collegiate; the elementary work is in seven grades, the academic in four and the collegiate in two. Though the institute is a high school and confers no degrees, the work of the collegiate department overlaps the first two years of a regular college course.

PACKING INDUSTRY. See MEAT PACKING; MEATS AND MEAT PRODUCTION.

PACO, a name of the alpaca (q.v.).

PACTOLUS, păk-tō'lŭs, Asia Minor, the classic name for the modern SARABAT, a small Lydian stream anciently celebrated for its golden sand, the reputed source of the wealth of Crœsus. It is now comparatively worked out. It rises on the north side of Mount Tmolus, flows past Sardis, and has its outlet in the Hermus.

PACUVIUS, pa-kū'vi-ŭs, **Marcus,** Roman tragic poet, nephew of the poet Ennius: b. Brundisium, about 220 B.C.; d. Tarentum, about 130 B.C. He was a student under Ennius and not only a poet but a painter as well, as is shown by the many allusions to his picture of Hercules in the Forum Boarium. Most of his tragedies followed Greek models; such were the 'Antiope' and the 'Dulorestes,' the latter being adapted from Euripides' 'Iphigenia in Tauris'; among native plays by him the one most often mentioned is the 'Paulus,' written in honor of Lucius Æmilius Paulus. He also wrote satires, but of this great body of work nothing but a few quotations by grammarians and rhetoricians has come down to us; these are edited by Ribbeck in 'Scænicæ Romanorum Poesis Fragmenta' (Leipzig 1897). Consult Müller, 'De Pacuvii Fabulis' (1890).

PADANG, pä-däng', Sumatra, two Dutch residences or provinces on the west coast of the island, known respectively as the Highlands and the Lowlands of Padang; also the capital city of the Lowlands of Padang at the confluence of the Padang Aran and the Padang Idel, which are very shallow and so make a poor harbor. The present port of Padang is Emmahaven, separated from Padang by a hill known as the Apenburg because of the apes there. The city has government workshops, barracks, schools, hospitals and churches, and was the earliest Dutch city in Sumatra (1666). It does business with the interior of the island by rail, and exports nutmegs, coffee, cinnamon, rattan, copra, tobacco, gum and hides. The city has a European and a Chinese quarter, in which there are a few stone houses; elsewhere bamboo is used. The climate is hot and not very healthful. The city has several consulates. Pop. about 90,000. The capital of the Highlands of Padang is Fort de Kock. Pop. 2,290.

PADDINGTON, England, a metropolitan and parliamentary borough of London, immediately north of the city of Westminster. Area, 1,356 acres. Bayswater is a well-known residential district and was a favorite haunt of artists in the 18th century. The borough returns one member to Parliament. Pop. about 142,551. Consult Bates, ‹The Playground of Paddington› (1902); Robins, ‹Paddington, Past and Present› (1853).

PADDLE, a wooden implement consisting of a wide, flat blade with a short handle, by means of which a small boat or raft is propelled, the operator spooning the water toward him. In canoes a double-headed paddle is used, being dipped alternately on either side. The paddle is found as a substitute for the oar in many parts of the world.

PADDLE-FISH, SPOON-BILL CAT, or **SPADE-FISH,** a singular ganoid fish (*Polyodon spathula*) of the sturgeon tribe, *Chondrostei* (q.v.), which takes its name from the extraordinary spatulate prolongation of the nasal bones and upper jaws into a thin, spade-like, mud-digging instrument, measuring a third to a quarter of the total length of the fish. It abounds in the more sluggish parts of the rivers of the Mississippi Valley and of the Southern States, and occasionally reaches a length of more than six feet and 75 to 100 pounds in weight. In general form it resembles a sturgeon, but the skin is destitute of plates or scales, except on the upper lobe of the tail, and is a dull greenish mud-color in hue. The gill-apertures are of large size, and the gill-covers are prolonged backward nearly to the middle of the body. The mouth is large and provided with teeth in the young, but they disappear as the fish grows older.

The paddle-fishes «feed chiefly on mud and minute organisms contained, stirring it up with the spatulate snout.» Their spawning habits are little known, but apparently the eggs are voided as soon as the water where each fish lives reaches a fair degree of warmth; at this time they ascend the streams and bayous, swimming near the surface, and are caught by means of seines. At other seasons they may be caught on set-lines. Formerly the flesh, which resembles that of the sturgeon, was eaten only by the southern negroes, but now it finds a sale in many local markets, and is frequently smoked and sold for sturgeon. The greenish black roe is also coming into demand for the making of caviar. Another closely related form (*Psephurus gladius*) lives in Chinese rivers, and the two species constitute the order *Selochostomi* family *Polyodontidæ,* fossil remains of which are found in Wyoming as far back as the Eocene. Consult Jordan and Evermann, ‹American Food and Game Fishes› (1902), and other authorities therein cited.

PADDOCK, păd'ŏk, **Algernon Sidney,** American lawyer and politician: b. Glens Falls, N. Y., 9 Nov. 1830; d. Beatrice, Neb., 17 Oct. 1897. He studied law, and removing to Nebraska in 1857 was admitted to the bar there and became prominent in the political life of the Territory. In 1859 he was delegate to the Territorial Republican Convention, and in 1860 and 1864 to the National Republican Convention. In 1861 he was appointed secretary of the Territory, holding this position till 1867 when Nebraska was admitted to the Union, for a part of this time acting as governor. In 1868 he declined an appointment as governor of Wyoming Territory. In 1875 he was elected to the United States Senate and again in 1887, while between his two terms in the Senate he was for four years a member of the Utah Commission. While in the Senate he was a member of several important committees, including the committee on pensions, on public lands, on post offices and on public buildings, and during his last term was chairman of the committee on agriculture and forestry.

PADDY-BIRD, the name among English-speaking persons in the East for various birds frequenting rice fields, especially small white egrets of several kinds.

PADELLA (Italian, from Latin *patella,* a small flat dish), a shallow vessel used in illuminations. A number of them are partially filled with oil or grease, in the middle of which is placed a wick, and are then placed so as to bring out when lighted the outlines of a building or the slope of a rising ground. The idea originated in Italy.

PADEMELON, a small, naked-nosed kangaroo of the genus *Halmaturus,* specifically *H. thetidis,* or New South Wales. It inhabits brushy districts and with others of its race in Australia and Tasmania is hunted for the sake of its flesh and hide.

PADERBORN, pä'dĕr-bŏrn, Germany, a town and espiscopal see in the Prussian province of Westphalia, at the sources of the Pader, 50 miles southeast of Münster. It is an old town, with narrow streets and antique houses. It has a fine recently restored cathedral, with a tall and massive tower which, as well as the crept, belongs to the 11th century — both in the Romanesque style; while the body of the church, 345 feet long, is of the 13th century. It has also a fine market place, an ancient town-house and several other ancient churches and chapels. The city was much favored by Charlemagne. Throughout the Middle Ages Paderborn, which was a Hansatown, was the seat of a bishop who was also a temporal prince. The bishopric was secularized in 1803 and was taken over by Prussia. The industries include printing, flour, soap, glass, beer and tobacco. The ground on which it stands teems with mineral springs. The university which existed at this place from 1614 was suppressed in 1819. Pop. about 27,000, mostly Roman Catholics.

PADEREWSKI, Ignaz Jan, pianist and composer; first premier of the Polish Republic: b. Kurilovka, Podolia, Poland, 6/18 Nov. 1860. He began studying music at the Warsaw Conservatorium under Raguski at the age of seven and went on his first concert tour in 1876–77, touring Russia, Siberia and Rumania. He became teacher of the pianoforte at his first academy in 1879 and three years later went to Berlin, studied under Urban and Wüerst and, finally, at Vienna under the distinguished teacher Leschetizky. In 1887 he made his formal appearance as a concert pianist in Vienna and 1889 in Paris, from which time his career has been an ever-extending triumph, he being universally regarded as the most brilliant executant on the piano since Liszt. He gave a series of recitals in London during May 1890 and toured America in 1891, where he has frequently appeared since. By a deed of trust, 15 May 1900, he established the Paderewski Fund, to be held as a permanent trust for the purpose of aiding musical education in the United States, and particularly for the support and encouragement of American composers. Prizes are offered every three years for the best compositions submitted by American-born composers to a selected board of judges. The first competition was held in 1902, when three prizes of $500 each were awarded: for a symphony, *The Seasons* (Henry K. Hadley); a composition for chorus, solos and orchestra, *A Star Song* (Horatio W. Parker), and a sextet for wind instruments (Arthur Bird). The exact terms of the trust provide (1) $500 for the best orchestral composition in symphonic form; (2) $300 for a composition for solo instrument with orchestra; (3) $200 for a piece of chamber music. In the second competition, in 1906, only one award ($500) was made, for an *Ouverture Joyeuse,* to Arthur Shepherd of Salt Lake City. M. Paderewski's first wife died young, leaving a son. He married, secondly, Mme. Gorski in 1899. Between 1913 and 1918 he appeared frequently in the United States, and during the war played an active part in the relief of Polish war sufferers and in the public propaganda to restore the independence of Poland. He became Premier on 17 Jan 1919, and in April of that year he presented the case of Poland to the Peace Conference in Paris.

PADILLA, pä-thēl'yä, **Juan Lopes de,** Spanish warrior: b. Toledo, about 1490; d. 24 April 1521. A the outbreak of the insurrection of the Castilian towns against the arbitrariness of Charles V, the Santa Junta entrusted him with the command of the forces of the communeros. The Junta first tried to enthrone the insane queen Joanna. It offended the nobles, however, by its democracy, and replaced Padilla by the less competent Don Pedro de Giron. After several successes his force was defeated by the royal army at Villalar, 23 April 1521. He himself was wounded and taken prisoner and executed on the following day. The two letters in which, shortly before his execution, he took leave of the town of Toledo and of his wife Maria Pacheco, were known in Spain as models of magnanimous feeling and touching simplicity. Both he and his widow, who defended Toledo for some time after his death, until she was compelled to take refuge in Portugal, have become the subject of numerous dramas and poems.

PADILLA, Bolivia, capital city of the province of Tomina and department of Chuquisaca, 90 miles northeast of Potosi. Originally called Laguna, the city now bears the name of Manuel Asencio Padilla, a patriot of this province, killed at Villar, 14 Sept. 1816. Pop. about 1,700.

PADISHAH, in Persia, a title assumed by or applied to the shah, derived from *pati,* lord (protector) and *shah* (king, prince). It is also applied to the sultan of Turkey and in India to the British sovereign.

PADMA, Hindu goddess of fortune and beauty, wife of Vishnu. See SRI.

PADUA, păd'ū-ą, or **PADOVA,** pä'dō-vă, Italy, a university city, capital of the province of the same name, 22 miles west of Venice, on the Bacchiglione. It is surrounded by a lofty wall flanked with bastions, and is entered by seven gates. It is connected by canals with the Adige and the lagoons of the Adriatic. The streets and squares are usually lined with colonnades. The largest and finest of the piazzas is the Piazza Vittorio Emanuele, formerly called the Prato della Valle, which is planted with trees, surrounded by a running stream and adorned with numerous statues of distinguished townsmen and other Italians. The principal buildings are the town-house or Palazzo della Ragione, an immense pile extending along the market place, erected between 1172 and 1219 and remodeled in 1420, standing upon open arches and containing a large hall adorned with fine mural paintings, about 400 in number; the late Renaissance Duomo or cathedral built in the 16th century, possessing a fine library, rich in rare books and manuscripts, and of which Petrarch, who was canon of the cathedral, is reckoned one of the founders; the baptistery of the cathedral, a fine Lombard building of the 12th century, its walls and cupola entirely covered with frescoes; and the Church of Saint Anthony. The most famous establishment in Padua is the university, one of the most ancient in Europe, said to have been founded early in the 13th century by Emperor Frederick II, but according to other accounts not founded till 1260, and sanctioned by Pope Urban IV in 1263. It was long renowned as the chief seat of law and medicine, and is celebrated for its long list of notable professors, including Galileo, Guglielmini and Fallopius, and for its students, including Dante, Petrarch and Tasso. The average annual attendance of students is 1,500. In connection with the university is a botanic garden, the oldest in Europe, containing some of the earliest specimens of trees and plants once rare, but now generally diffused; a library of over 200,000 volumes and an observatory. The manufactures include silk fabrics, ribbons, catgut, chemicals, machinery, automobiles, etc., and like the trade in cereals, oils, wines and cattle, are increasing. Padua is the see of a bishop and the seat of several superior courts and public offices. It claims to have been founded shortly after the destruction of Troy by the Trojan Antenor. Under the Romans it became a flourishing municipal town, but on the decline of the empire was sacked first by Alaric and then by Attila. Its great modern restorer was Charlemagne, under whose successors it successfully asserted its independence. In 1318 it fell under the domination of the Carrara family, and in 1405 under that of Venice, whose fortunes it has since followed. Among the distinguished men to whom Padua has given birth are the historian Livy, Sperone Speroni, a writer of tragedies in the 16th century; Mantegna; the poet Cesarotti. Pop. of city 50,000, with communal suburbs 96,250.

PADUCAH, pą-dū'ką, Ky., city, county-seat of McCracken County; at the confluence of the Tennessee and Ohio rivers, and on the

Nashville, Chattanooga and Saint Louis, the Illinois Central and the Chicago, Burlington and Quincy railroads, about 35 miles in direct line east by north of Cairo, Ill., and 80 miles southwest of Evansville, Ind. A splendid modern railway bridge which cost $4,500,000 spans the river here. There is steamer connection with Mississippi, Ohio and Tennessee river ports. It was settled in 1821 by James and William Pore, and was incorporated 11 Jan. 1830. During the Civil War the city was occupied by General Grant in September 1861. It is in a productive agricultural region; in the vicinity are forests of hard and soft wood and deposits of fire-clay, glass sand, zinc and fluorspar; limonite is found within 30 miles, and coal, in rich veins, within 60 miles. It has extensive manufacturing interests; the chief manufactures are pig iron, lumber, veneering, building material, spokes, rims, staves, headings, barrels, curtain poles, furniture, stoneware, pottery, saddles, collars, harnesses, tobacco products, knit goods, canned goods, brooms, brick, proprietary medicines, beer and flour. It has a large ore milling plant and novelty works, in all 91 manufactories giving employment to about 3,000 persons and the two railroads employ about 1,200. There is an extensive wholesale trade in clothing and food products, and in its own manufactures. The prominent public buildings are the United States government building, municipal buildings, churches and schools, Carnegie library. The educational institutions are Saint Mary's Academy, a high school, public and parish schools and a number of private schools. There are 23 churches. The six banks have a combined capital of $1,350,000; the bank clearings are annually about $50,000,000. The government is administered under a commission form of government with mayor and four commissioners. The city owns and operates the electric light plant. Pop. 22,760.

PÆAN, a word originally meaning «helper» or «healer.» Homer applied it to the physician of the gods on Olympus. The title was later transferred to Apollo, and was used in hymns as his epithet. By a second transferrence, the hymn itself became called a pæan, and later similar invocations to the other gods came to be known by that name. Pæans were sung to ward off evil, as before a battle, on the march or when a fleet sailed out of harbor. They were also sung after a battel in token of gratefulness to Apollo. Pæans were also sung at public funerals and at banquets. Pindar and Bacchylides were among the more noted authors of pæans. Consult Fairbanks, A., 'A Study of the Greek Pæan' (New York 1900).

PÆDOGENESIS, the reproduction of animals while in the immature or larval stage. Thus certain salamanders (*Amblystoma*) produce eggs which develop into adults when the parents still retain the gills and are aquatic in their habits. (See Axolotl). More strictly pædogenesis is applied to parthenogenesis (q.v.) in the larval stage. Best known instances are certain flies (*Miastor*), where the larvæ produce eggs which develop without fertilization, inside the body and these finally escape by eating their way out, the parent being destroyed as a consequence.

PÆONIUS, Greek sculptor of the 5th century B.C.: b. Mende, Thrace. He is best known through his statue of Victory erected at Olympia about 420 B.C., in commemoration of some battle, probably Sphacteria. The pedestal was triangular and about 30 feet in height. The figure of Nike is represented in flight, with feet barely touching the pedestal, the weight of the figure being supported mainly by the draperies. Other figures at Olympia were ascribed to Pæonius. Consult Gardner, E. A., 'A Handbook of Greek Sculpture' (London 1911).

PÆONY, a genus (*Pæonia*) of the order *Ranunculaceæ*. With one exception (*P. brownii*), native to the Pacific Coast, the species are natives of Europe and Asia, and improved varieties and hybrids of the original wild sorts are found in most gardens, being valued for their hardiness, easy cultivation and large, attractive flowers. They are of two distinct groups: the herbaceous and the shrubby. The former group is the larger; they are perennials with tuberous rootstocks, large pinnate leaves and flowers ranging through all shades of red to white and yellow, the varieties cultivated being mostly the double forms. The plants will grow in almost any soil, but thrive best in rich, rather moist deep loam. The crowns should be set two inches below the surface and the ground, especially close to the plant, kept free from weeds. All weakly stems should be removed. When once established, annual dressings of stable manure should be given and the plants left undisturbed. Properly treated, pæonies will often prove satisfactory for 25 years without removal or renewal. *P. officinalis*, a native of southern Europe, produces large flowers abundantly during late spring. *P. albiflora*, a native of Siberia, blossoming about a month later than the preceding species, has fragrant flowers. Most of the cultivated varieties have been developed from these two species by Japanese and Chinese gardeners who have been cultivating and crossing them for centuries. The roots of *P. albiflora* are used by the Tartars for food. Several species are known as Chinese pæonies, but this term is more widely applied to hybrids and varieties of a more extended list than to the native Chinese kinds. They are fragrant and double-flowered. *P. tenuifolia*, or the «fern-leaved» pæony, is a native of Russia. Its blooms are single. The tree-pæony (*P. moutan*) often grows six feet tall, is much branched, and prolific of blooms ranging up to 12 inches across. It is somewhat less hardy than the common pæony, and in the North is often grown as a greenhouse plant. It is a native of China, where it has long been cultivated and where there are hundreds of varieties. In America it is less known than the first two species. When grown out of doors the tree-pæonies should be mulched with litter or leaves if in exposed places, especially north of Philadelphia. Pæonies are propagated by division of the root clusters, in the case of the herbaceous forms, and by cuttings of the young wood, or by layering, with the tree forms. The latter are also multiplied by grafting in early spring under glass upon the tubers of the herbaceous sorts. New varieties are produced from seeds obtained from the single flowers by fertilizing them with pollen from the double flowers. These seeds are sown in September: some germinate the following spring, others not till a year later. Only a very few seedlings among thousands prove worthy of perpetuation. Consult Harding, A., ‘The Book of the Pæony’ (Philadelphia 1917).

PAER, pä-är′, **Ferdinando,** Italian composer: b. Parma, Italy, 1 June 1771; d. Paris, France, 3 May 1839. He was educated in Venice, summoned to the court of Vienna in 1795, and in 1801–07 was chapel-master at Dresden. After the battle of Jena he was attached to Napoleon's court, where he was imperial composer; in 1812–27 he directed the Italian grand opera at Paris, and in 1831 was elected to the Academy. He had received the cross of the Legion of Honor in 1828. His work is rich in melody and his greatness as an Italian composer is unqeustioned, yet of his voluminous work little is remembered. He was at one time joint conductor with Rossini at the Théâtre Italean. His best known operas are ‘Griselda’ (1796); ‘Camilla’ (1801); ‘Agnese’ (1819).

PAESE DI CUCCAGNA, Il, (‘The Land of Cockaigne’), obviously influenced by the French naturalistic school of writers, in particular by Zola. Matilde Serao in her massive canvas, ‘Il paese di cuccagna’ (1891), has described the destructive blight of the state lottery on all classes of Neapolitan society. Endowed with the quick eye of the born journalist, which sees and notes the varied phases of the teeming life of a great city, this energetic and gifted novelist has caught with her usual felicity the every expression of the multitude of gamblers, from the bootblack and little seamstress who risk their meagre sustenance, to the impoverished nobleman who seeks to retrieve the fallen fortune of his house.

The book unfolds like a great panorama in a series of episodes which portray the various strata of society madly bent on pursuing the mirage of suddenly acquired affluence, ‘The Land of Cockaigne.’ The author excels especially in her street scenes, in the study of crowds in action, in the multicolored hurly-burly of the Neapolitan population. Particularly fine is the opening scene of the lottery drawing, with its intensified suspense, its paroxysm of excitement, and the utter dejection of the disappointed players. The description of the procession and miracle of San Gennaro, incomparable in its portrayal of the ecstatic religious fervor and gross superstition of the assembled worshippers, can well bear comparison to the procession in D'Annunzio's ‘Triumph of Death’ and the famous pilgrimage in Zola's ‘Lourdes.’ The minor characters, especially those low in the social scale, are drawn by a master hand.

The style, at times too insistent on elaboration of detail, pulsates with the life of Naples and reflects the speech of its people as only Serao can convey it. While not as perfect a work as the author's admirable sketches of Neapolitan life, episodic in treatment and over-intent on the thesis, ‘Il paese di cuccagna’ is Matilde Serao's most famous novel and a vivid, intense agonizing picture of a great evil. Consult Benedetto Croce, ‘La letteratura della nuova Italia’ (Bari 1915, v. 3); René Doumic, ‘Un roman de moeurs napolitaines’ in *La Revue des Deux Mondes* (July 1898); *The Atlantic Monthly,* ‘Serao's Il paese di cuccagna’ (August 1892); Henry, James, ‘Notes on novelists’ (New York 1914). For an English translation consult ‘The Land of Cockayne’ (New York 1901).

Alfred G. Panaroni.

PÆSTUM, pĕs′tŭm, ancient Greek city of Southern Italy on the west coast of Lucania and the present Gulf of Salerno (in ancient times *Sinus Puestanus*). It was founded as early as the beginning of the 6th century B.C. by colonists from Sybaris under the name of Posidonia (that is, “sacred to Poseidon,” or Neptune), and attained great prosperity in the next century and a half. The city was conquered by the Samnites of Lucania, about 400 B.C., who probably Italianized its name into Pæstum. It did not regain its old position even when a century later (273) it became a Roman colony, but is famed in Roman poetry for its roses. It was sacked in the 9th century by the victorious Saracens, and in the 11th by Robert Guiscard. The poor village of Pesto, a railway station, now occupies the site, which has, however, two remarkable Doric temples, one to Poseidon, the tutelar god, and one to Demeter. Consult Labrouste, ‘Les temples de Pæstum’ (1877).

PÆTUS, pē′tŭs, **Cæcinna.** See Arria.

PAEZ, pä′äth, a South American Indian tribe, supposed to constitute a separate linguistic stock. The tribe inhabits about a score of villages in the Central Cordilleras, to the west of Bogotá, Colombia. They live by hunting and wear little raiment despite the cold region in which they dwell. They weave hats, mats, rugs and cloth from magney fibre, and are also familiar with the working of gold. A house in which either a birth or death occurs is at once committed to the flames. The tribe numbers about 2,000 individuals. Consult Brinton, D. G., ‘The American Race’ (New York 1891).

PAEZ, José Antonio, Venezuelan patriot and soldier: b. Araure, 13 June 1790; d. New York, 6 May 1873. He was of native stock and with a body of llaneros, trained like himself as herdsmen, about 1810 joined the patriot army, in which he became division commander in 1819. He administered a severe defeat to the Spaniards in 1821 and in 1823 captured their last port, Puerto Caballo. Jealous of his successor in 1826 he attempted rebellion but was conciliated by Bolivar, who made him military and civil chief of Venezuela, thus paving the way for the war of Venezuelan independence in which Paez was the prime mover. In 1831–35 he was President of the new republic, and held the same office 1839–43 after acting as commander-in-chief during Vargas' administration and putting down two serious rebellions. In 1846 he was appointed dictator during the race war; in 1848 refused the presidency; later headed a rebellion against Monagas, but was defeated and imprisoned for several months; spent eight years in banishment; returned to Venezuela in 1858; was minister to the United States in 1860; became commander of the army in 1861; and was again driven into exile in 1863 by a revolution against his lieutenants, to whom he had entrusted large powers. The Federalist party was successful and Paez, leader of the Centralists, passed the remainder of his life in New York. Consult his ‘Autobiografia’ (1867).

PAGAN, pä-gän', India, a town of Upper Burma, on the east bank of the Irawady, 90 miles southwest of Mandalay. Pagan was founded in 847 A.D., and was the capital of Burma until 1298, when it was abandoned during a Chinese invasion. The remains of Buddhist temples and pagodas cover an extensive area, and are of great archæological interest. Some of them are still occupied by priests, and the town has a population of about 6,000, chiefly Buddhists.

PAGANINI, pä-gä-nē'nē, **Niccolo,** Italian violinist: b. Genoa, 18 Feb. 1784; d. Nice, 17 May 1840. His father discerning the talents of his son put him at an early age under the best masters to learn the violin, and his public appearances began at the age of nine. In his 12th year he went to Parma, where he was taught counterpoint by Rolla (see ROLLA, ALESSANDRO) and Ghiretti. In 1797 he performed in the cities of Lombardy and afterward in the principal cities of all of Italy. He settled at Lucca, in 1805, where he was appointed principal violinist to the court chapel. In 1808 he left Lucca, and for five years lived an obscure and rambling life in Italy. In 1813 he reappeared before the world, and performed at Milan. He remained in Italy till 1828, suddenly appearing, and, after exciting unbounded enthusiasm by his public performances, as suddenly departing. In the year mentioned he visited Austria and Germany, appearing first in Vienna. The wonder which he excited was caused not merely by his extraordinary skill, but also the extraordinary stories circulated concerning his career and by his personal appearance, which had something weird and even demoniacal in it. His imitation of the flageolet, and his rendering of whole pieces on the G string were feats of astounding technique. The emperor of Austria appointed him his chamber virtuoso, and the king of Prussia his director of music. After visiting the great towns of Germany he proceeded to France and Great Britain. In Paris he produced an unprecedented sensation, and, as in Germany, made immense gains. While in England his profits amounted to $85,000. He returned in 1834 to Parma, where he purchased the villa Gajona. Among his many compositions, one of the most celebrated is the ‘Carnival of Venice.’ Consult Kapp, J., ‘Paganini’ (Berlin 1913); Stratton, S. S., ‘Niccolo Paganini; His Life and Work’ (New York 1907).

PAGANS (Lat. *pagani*, those who live in the villages, *pagus*), those who remained unconverted to Christianity and the worship of the true God. While the cities were the centres of Christian life the remote villages (*pagi*) were still in pagan darkness, and their inhabitants kept up the practice of idolatry and the creed of polytheism. The men of the village, pagans, among the Latin races corresponded to the men of the heath, heathens, among the Teutonic races. The explanation has also been given that the pagans or «rustics» were so termed in contrast to the «soldiers of Christ.» The term pagan, though formerly with the cognate «paynim» applied to Moslems, is not properly applied to Jews or Mohammedans since these worship the one God, the Jehovah, of Christians and Jews. The Mohammedan term *kafir*, meaning «unbeliever,» is likewise withheld from Jews and Christians. The Jewish analogue of «pagan» is *goy*, translated «gentile» (q.v.) meaning, «one who belongs to the nations» (of Greece and Rome).»

PAGE, Carroll Smalley, American legislator: b. Westfield, Vt., 10 Jan. 1843. He was educated at the People's Academy, Morrisville, Vt., and at Lamville Central Academy, Hyde Park, Vt. For many years he was a dealer in raw calfskins and acquired interests in various banking, manufacturing and other enterprises. In 1869–72 he was member of the Vermont house of representatives, in 1874–76 of the senate, and from 1872 to 1890 was member of the Republican State Committee. He was delegate to the Republican National Conventions of 1880 and 1912; was register of probate in 1880–91; savings bank examiner in 1884–88, and governor of Vermont in 1890–92. On 21 Oct. 1908 Mr. Page was elected to the United States Senate for the unexpired term (1908–11) of Redfield Proctor, deceased. He was reelected for the terms 1911–17 and 1917–23.

PAGE, Curtis Hidden, American educator and editor: b. Greenwood, Mo., 4 April 1870. In 1890 he was graduated at Harvard University, after which he studied at Paris and at Florence. He was instructor in French and lecturer on English literature at Western Reserve University in 1891–92; instructor in French at Harvard in 1893–94; lecturer and tutor 1895–1906; adjunct professor 1906–08; professor of Romance languages and literatures 1908–09 at Columbia; professor of English literature at Northwestern University 1909–11 and since 1911 Winkley professor of English language and literature at Dartmouth College. In 1905 he was associate editor of *Poet Lore* and of the *Pathfinder* the following year. Professor Page has translated ‘A Voyage to the Moon,’ by Cyrano de Bergerac (1899); ‘Songs and Sonnets of Ronsard’ (1903); ‘The Best Plays of Molière’ (2 vols., 1907); ‘Tartuffe’ (1909); ‘The Man who Married a Dumb Wife,’ by Anatole France (1915). He is a contributor of poems, essays and stories to leading magazines and has edited ‘British Poets of the Nineteenth Century’ (1904); ‘Rabelais’ (1905); ‘The Chief American Poets’ (1905); ‘Golden Treasury of American Songs and Lyrics’ (1914).

PAGE, David Perkins, American educator: b. Epping, N. H., 1810; d. 1848. He received his education at Hampton Academy and for several years was principal of the High School at Newburyport. From 1845 to 1848 he was principal of the Albany State Normal School. He published ‘Theory and Practice of Teaching, or the Motives of Good School Keeping’ (1847), a work of permanent value to educators. Consult the edition of 1886 in which there is a short biography of the author by W. H. Payne.

PAGE, John, American legislator: b. Rosewell, Va., 17 April 1744; d. Richmond, Va., 11 Oct. 1808. He was graduated from William and Mary College in 1763, where he was intimate with Thomas Jefferson. He served under Washington in an expedition against the French and Indians, and during the American Revolution acted as a member of the committee of public safety and as lieutenant-governor of the commonwealth, sacrificing to the cause of the colonies a large share of his private fortune. He served in Congress in 1789–97, and in 1802 was elected governor of Virginia. In 1805 he was appointed by President Jefferson commissioner of loans for Virginia, which position he held until his death.

PAGE, Richard Lucian, naval officer, soldier: b. Clarke County, Va., in 1807; d. Norfolk, Va., 1901. Page entered the United States navy as midshipman in 1824 and in 1855 he reached the grade of commander. During this period his service was the usual routine of sea and shore duty. At the outbreak of the War of Secession he resigned and entered the Confederate service as commander in the navy. He fortified the mouth of the James River and other points on the coast, and then established large ordnance foundries at Charlotte, N. C., which he managed for two years. In 1864 he was made brigadier-general and placed in command of the outer defenses of Mobile Bay. His defense of the forts against Farragut's bombardment was a magnificent exhibition of courage and endurance. After the war General Page resided in Norfolk where he was for several years superintendent of schools.

PAGE, Thomas Jefferson, American naval officer, grandson of John Page (q.v.): b. Shelly, Gloucester County, Va., 4 Jan. 1808; d. Rome, Italy, 26 Oct. 1899. In 1853–56 he was lieutenant-commander in explorations of the La Plata region in South America, and in February 1855 his vessel was fired upon from a Paraguayan fort. Resigning in 1861 he then entered the Confederate service, was commissioned commodore and in 1862 was sent to England to take charge of a cruiser. As, however, he was prevented from taking the ship out he secured the command of a small iron-clad at Copenhagen, which was soon after seized from him while in a Spanish port. Leaving the service he subsequently resided in Argentina and in Florence, Italy. He wrote 'La Plata, the Argentine Confederation, and Paraguay' (1859).

PAGE, Thomas Nelson, American lawyer and author: b. Hanover County, Va., 23 April 1853. He was educated at Washington and Lee University, studied law for a year at the University of Virginia, was admitted to the bar, and established himself in practice at Richmond. His avocations became literature and lecturing. Perhaps no post-bellum writer has depicted with so rare a skill the negro and white life of slavery, war-time and reconstruction. His rendering of the Virginia colored dialect in such stories as 'Marse Chan,' first printed in the *Century* (1884); later in the collection 'In Old Virginia' (1887), assumed a real philological importance. Among his further writings are 'Befo' de War,' poems by A. C. Gordon (1888); 'On Newfoundland River' (1891); 'Elsket' (1891); 'The Old South,' essays (1892); 'Red Rock' (1898); 'Gordon Keith' (1903); 'Bred in the Bone' (1904); 'The Negro' (1904); 'The Old Dominion' (1908); 'Robert E. Lee' (1911); 'The Land of the Spirit' (1913); 'The Stranger's Pew' (1914). In 1913 he was appointed by President Wilson as Ambassador to Italy. He is a member of the American Academy of Arts and Letters. See IN OLE VIRGINIA.

PAGE, Walter Hines, American publisher and diplomat: b. Cary, N. C., 15 Aug. 1855; d. Pinehurst, N. C., 21 Dec. 1918. He was educated at Randolph-Macon College, Va., and Johns Hopkins University, abandoned teaching for literary work and became editor of *The Forum* 1890–95, literary adviser to Houghton, Mifflin and Company, publishers, 1895–99; and editor of *The Atlantic Monthly* 1896–99. He was one of the founders of the publishing house of Doubleday, Page and Company in 1899; the editor of *World's Work* from 1900 to 1913, and from 1913 to 1918 during the arduous period of the Great World War was American Ambassador to Great Britain. He received the degree of D.C.L. from Oxford University in 1914. He was the author of numerous magazine contributions and of 'The Rebuilding of Old Commonwealths' (1902).

PAGE, William, American artist: b. Albany, N. Y., 23 Jan. 1811; d. Tottenville, Staten Island, 1 Oct. 1885. He studied under James Herring and Samuel F. B. Morse, at the Academy of Design, and lived 11 years in Italy, copying the Italian masters and especially Titian. He spent much time in analyzing the methods of that master and was so successful in imitating his style and coloring that one of his pictures was seized by the Florentine authorities as an original Titian which was being conveyed out of the country. In 1836 he was elected a member of the National Academy, of which he was president, 1871–73. Among the portraits painted by him are those of John Quincy Adams, the Brownings, Charlotte Cushman and others, including a full-length likeness of Admiral Farragut, which was purchased and presented to the emperor of Russia. His chief paintings are 'The Holy Family' (1837); 'The Last Interview' (1838); 'Ruth and Naomi' (1880).

PAGEANT, pāj-ĕnt. The exact derivation of this word is uncertain. The pageant in the old-world sense was originally a spectacular street procession, with more or less symbolical figures and tableaux mounted on movable platforms or trolleys. Most of the early references are contained in Sharp, T., 'Dissertation on the Pageants or Dramatic Mysteries, anciently performed at Coventry' (Coventry 1825). Observe that in this title the pageant is very properly bracketed with the mystery, for nothing can be more certain than that it developed hand in hand with the mediæval mystery play. With the abatement of superstition that followed the passage of the year 1000 A.D., when so many gloomy prophecies went for nought, the people took heart of grace and called for entertainment: and if they might make merry in the field and in the shop, why not also in the church? Hence the ecclesiastical play, and the steady growth of the community folk play, under many secular forms, up to the advent of the Elizabethan dramatists in England, and of Corneille in France. The earliest recorded pageant in England was in 1236, on the occasion of a royal marriage at Canterbury. Pageantry was for a long time an important adjunct to coronation festivities, and was extremely popular with the people. In the 15th century a king of England granted a parcel of land and the money with which to build a pageant house to the Company of Weavers. Not the least of the services of this guild was that while they wove the most beautiful of English tapestries they also carried the joys of pageantry to the highest pitch of those days. In the following century the pageant festival at Kenilworth Castle in honor of Queen Elizabeth created a tradition of splendor. The lord mayor's show in London, and the parades of labor and other fraternities, with their banners and tableaux, are but lean and limp survivals of the old pageants. Even to this day many of the cities of Great Britain, France, Holland, Belgium, Germany, Italy, etc., commemorate their great men and the proud events of their history by processional pageants of the citizens in the costumes of many periods.

In the United States the celebrations of *Mardi Gras* in New Orleans and elsewhere in the South, the Festival of the Veiled Prophet in Saint Louis and other harvest festivals, the flower festivals of Southern California, with that of La Portola in San Francisco, are all direct descendants of the older forms of pageantry. In 1863, at Saint Louis, an early form of indoor war pageant was presented in a series of historic tableaux entitled “America as it was, and America as it is.” But the pageant in its late development is usually a far cry from these simple parades and spectacles. Episodical and dramatic construction, historical in content, educational and social as well as æsthetic in its aim, the writers, composers, designers and all other artists implicated, have nowadays a scope for creative energy that was quite beyond the compass of the old régime. See COMMUNITY DRAMA). With the two already mentioned types in point of structure (the parade and the dramatic) it should be observed that there are also two main types in respect to content: (a) the social, concerning itself with some didactic phase, as illustrated by the Educational, the Renaissance and the Perfect City pageants; (b) the historical, envisaging the development of a given community, as shown in the Deerfield, Westchester, Peterborough, Illinois, Cape Cod and Indiana pageants. The historical pageant has been described by William Chauncy Langdon as “drama in which the place is the hero and the development of the community is the plot. . . . The modern pageant is an instinctive expression in dramatic form of the new community spirit; and as there never before was such a community spirit in the history of the world, so there never was such an expression of it. . . . Folk-play would be a more technically correct expression.” The same writer, Mr. Langdon, in reviewing the fact that the technique of the historical pageant has reached a remarkably high standard in the United States, expresses himself conservatively in the following words: “In variety of form, in the pageant use of symbolism, in music, color, dance, in the crystallization of the civic value of the pageant — in these respects I believe we may fairly claim that the American pageant has made some advance upon the English.” Educational centres have turned to the pageant form, not only for the furtherance of their immediate pedagogical ends, but also for drawing the attention of elders to the educational system, persuading them to co-operation and to the unifying of the whole community life. The pageant spirit primarily seeks to encourage people of all classes and ages belonging to the institution or locality promoting the occasion to involve themselves in democratic and festal fashion in the preparations and performances. The list of the most important of recent pageants, with the names of the pageant authors, is as follows:

ENGLISH PAGEANTS.

1905. The Sherborne Pageant. (L. N. Parker).
1906. The Warwick Pageant. (L. N. Parker).
1907. The Saint Edmundsbury Pageant. (L. N. Parker).
The Liverpool Pageant — a procession. (D'Arcy de Ferrara).
The Oxford Historical Pageant. (Frank Lascelles).
The Portchester Pageant.
Romsey Millenary Pageant. (F. R. Benson).
The Saint Albans Pageant. (H. Jarman and P. Carr).
1908. The Chelsea Historical Pageant. (J. Harry Irvine).
The Dover Pageant. (L. N. Parker).
Winchester National Pageant. (F. R. Benson).
Gloucester Historical Pageant. (G. P. Hawtrey).
The Quebec * (North America) Tercentenary Celebration. (F. Lascelles).
1909. The Colchester Pageant. (L. N. Parker).
The Bath Historical Pageant. (E. Baring).
The English Church Pageant. (Hugh Moss).
Stepney Children's Pageant at London. (L. N. Parker and F. J. H. Darton).
The National Pageant of Wales at Cardiff. G. P. Hawtrey).
The York Pageant. (L. N. Parker).
1910. The Army Pageant at London. (F. R. Benson).
The Chester Historical Pageant. (G. P. Hawtrey).
The Ilford Children's Pageant. (L. C. F. Robson).
The Pageant of South Africa at Cape Town. (F. Lascelles).
1911. The Pageant of London. (F. Lascelles).
The West Dorset Historical Pageant at Bradpole. (E. Lloyd).
Mid-Gloucestershire Historical Pageant of Progress. (Miss May E. Cull).
1912. Oxford Millenary Pageant.

*British in form, spirit and subject matter and therefore included in this list.

PAGEANTS IN THE UNITED STATES.

1908. Pageant of Education, Boston, Mass. (Lotta A. Clark and Mrs. Cyrus A. Dallin).
Founders' Week Pageant-Parade, Philadelphia, Pa. (One of the best modeled parades ever held in America: In form it approached the pageant. (Ellis P. Oberholtzer).
1909. Pageant of the Italian Renaissance, Chicago, Ill. One of the finest pieces of pageant writing accomplished in America or England. (Thomas Wood Stevens).
Bronxville Pageant of Westchester County, N. Y. The first and one of the most complete American pageants of the historical type. (Violet Oakley and Eugene Sanger).
Lake Champlain Tercentenary Indian Pageant. Exclusively Indian; performed by members of an Indian Tribe. (L. O. Armstrong).
Pageant of Illinois, Evanston, Ill. White Man's civilization, and destruction of Indian tribal life of the West. (Thomas Wood Stevens).
Hudson-Fulton Celebration. Consult Hall, E. H., "Fulton-Hudson Celebration, 1909:" Albany 1911).
1910. Ripon Historical Pageant, Ripon, Wis. By the faculty and students of Ripon College. (J. F. Taintor).
Pageant of Old Deerfield, Deerfield, Mass. (Margaret M. Eager).
MacDowell Memorial Pageant, Peterboro, N. H. (George P. Baker and Mrs. Edward MacDowell).
Pageant of the Perfect City, Boston, Mass. The Boston civic pageant of 1915, also. Presented the development of the home. There were 2,000 participants including a tribe of Iroquois Indians. (Lotta A. Clark).
1911. Pageant of the History of Minnesota, Saint Paul, Minn. (L. W. Ziegler and Lilly A. Long).
Pageant for Independence Day, Chicago, Ill. Shows growth of the idea of freedom. (T. W. Steven and K. S. Goodman).
Pageant of Thetford, Vt. The first of a series on the "New Country Life." (William Chauncy Langdon).
1912. Historical Pageant, Schenectady, N. Y. (Constance D. Mackay).
Historical Pageant, Philadelphia, Pa. One of the largest and most important of pageants. Realistic. Over, 6,000 participants. (Ellis P. Oberholtzer).
Y. W. C. A. Foreign Pageant (Composed by a committee of which Miss H. L. Boutelle was chairman. Given simultaneously in some 75 different cities during the "World's Week of Prayer").
Pageant of Saint Johnsbury, Vermont. (W. C. Langdon).

1913. Pageant of the Old South Church, Boston, Mass. Indoors. (J. L. Smith and H. C. Greene).
Irish Pageant at New York. Indoors. (Anne Throop Craig).
Wisconsin Pageant, University of Wisconsin. (T. W. Stevens).
Pageant of Meriden, N. H. Education in the New Country Life. Music by Arthur Farwell. (Lotta A. Clark).
Pageant of Darien, Conn. Pageant of the Commuter. Music by Arthur Farwell. (W. C. Langdon).
1914. Progress of Women. Presented by the Men's League for Woman Suffrage, in the 69th Street Armory, New York. (Hazel Mackaye).
Romance of Work. Presented by the Association of Working Women in the 69th Street Armory, New York. (Mary P. Beegle).
"The Padres" and "The Pathfinder." Pageant-dramas presented at Santa Cruz, Cal. (Perry Newberry).
The Pageant of Nevada History, Reno, Nevada. (Jeanne E. Wier).
Pageant of Cape Cod, Bourne, Mass. Celebrated the completion of the Cape Cod Canal. Music by Daniel Gregory Mason. (W. C. Langdon).
1914. Pageant of St. Louis. Presented with the "Masque of Saint Louis," by Percy Mackaye. One of the most renowned of all pageants. (T. W. Stevens).
Pageant of the Champlain Valley, Plattsburgh, N. Y. (Margaret M. Eager).
Pageant of Chicago, Ravinia, Ill. (Ruth Coffin Collins.)
Roger Bacon Pageant, Columbia University, New York. (John Erskine).
Historical Pageant of Georgia, Atlanta, Ga. Given indoors by the D. A. R. (Mrs. W. L. Peel).
1915. Pageant of Austin, Texas. Music by Frank LeFevre Reed. (W. C. Langdon).
Brooklyn Historical Pageant, New York. (Virginia Tanner).
Pageant and Masque "The Golden Legend of California." Presented at the Exposition Park, Los Angeles, Cal. (Alfred Allen).
1916. Pageant of Indiana, Indianapolis, Ind. Shows the drama of the development of the State as a community from its exploration by La Salle to the centennial of its admission to the Union. Music by Charles Diven Campbell. (W. C. Langdon.)
Pageant of Yale University, New Haven, Conn. Probably the largest of all pageants in point of numbers. There were 7,000 performers. See COLLEGE DRAMATICS. (J. R. Crawford).
The Pageant of Bloomington and Indiana University. Music by Charles Diven Campbell. (W. C. Langdon).
The Masque and Pageant of Play, Northampton, Mass. (Margaret M. Eager).
The Cornell Pageant, Ithaca, N. Y. (Marjorie Barstow).
Shakespeare Festival, Columbia University. (Professor Abbott).
Shakespeare Masque, Wellesley, Mass. (Mrs. Laura Palmer Ingalls).
Shakespeare Tercentenary Masque, New York City. (Arthur Farwell, Percy Mackaye).
Cupid and Psyche, Yale School of Fine Arts, New Haven, Conn. (John J. Chapman, Horatio Parker, Jack Randall Crawford).
The New Vision, a Masque of Modern Industry, Buffalo, N. Y. (John Lund, Hazel Mackaye).
Shakespeare Tercentenary Civic Festival, Boston, Mass. (Lotta A. Clark).
Christmas Mystery, Duquesne, Pa. (Thomas Wood Stevens).
1917. Community Pageant, Boston, Mass. (Mrs. Pearl M. Keating).
Pageant of Womanhood, Boston, Mass. (Marie Ware Laughton).
Historical Pageant of Florida, Tallahassee, Fla. (Thomas Wood Stevens).
The Cornell Pageant, Ithaca, N. Y. (Marjorie Barstow).
The Drawing of the Sword, a war masque, Carnegie Institute of Technology, Pittsburgh, Pa. (T. W. Stevens, B. Iden Payne).
Caliban, by the Yellow Sands, a Masque, Boston, Mass. (Arthur Farwell, Percy Mackaye, F. Stanhope).
American Red Cross Masque, Huntington, L. I. (Joseph Linden Smith and T. W. Stevens).
Semi-Centennial Pageant, Drew Theological Seminary, Madison, N. J. (Marie Moore Forrest).
1918. Masque of the Titans of Freedom, George Washington and Abraham Lincoln, Urbana, Ill. (W. C. Langdon).

For complete lists of pageants, and for all details of construction, selection and production, music, costumes, etc.. consult the bulletins of the American Pageant Association. See the articles COMMUNITY DRAMA, FESTIVAL, MASQUES, PAGEANTRY; also the bibliographies under those headings.

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DUNCAN MACDOUGALL.

PAGEANTRY, pāj'ĕn'trē. The production of pageantry has become prominent in America since the advent of the 20th century, in some respects following the longer established English models, but developing in others certain relations to the industrial and educational improvement of towns or smaller interior social groups, which give it a somewhat distinctive character. This local improvement function may be traced in this country, especially since 1910, in the lists of «Civic Pageants» «Community Pageants,» and sectional «Historical Pageants» which have been noteworthy in a number of our States. There has been all manner of pageantry production illustrative of varied topics, since its recent especial popularity has been established, but the development of it for the type of social group improvement cited above, has been characteristic of the members of the American Pageant Association, who have studied methods for its production in this way as a peculiarly useful agent for community vitalizing. An interesting element of this development in its use is that it has gone hand in hand with the gradually increasing recognition of the importance of recreational facilities in all our communities, urban and country districts, alike, and has added to this, substantial lessons in the historic associations of places in ways to increase citizens' pride in their localities, and further, has presented opportunities for illustration of local industries and publicity for them in such manner as materially, in almost every instance of such experiments, to give new impetus and prosperity to them. This form of pageantry and its application deserve thus to take a place as representative in this country, at least, and the procedure followed in producing it, and applying it in this special way, by those directors who have made it distinctive, is a valuable example for others wishing to organize such festivals with a like object, in their localities.

The director in this community improvement type of pageantry has either been a resident of the community, or has taken up residence there on purpose to familiarize himself with its interests and activities so that he may illustrate and advertise them properly in his pageant. Technically the procedure has been in the preliminaries, like any other organization of forces for public celebrations. An initial committee of the most substantial and energetic citizens is formed to support the enterprise financially and actively. In some instances of small communities of good promise, at the recommendation of the director, the enterprise has been financed initially by one or another of our philanthropic organizations instituted for educational improvement, such as the Russell Sage Foundation, which materially aided in the pioneer work of this special form of local improvement pageantry. It may be seen that a director in these enterprises, must be one able himself to see the possibilities in any given community, industrially and otherwise, and to know how the celebration of its history and activities through a festival of pageantry entered into by the citizens may be a means of advancing its local interests. He must also be confident and enthusiastic enough to inspire the citizens themselves with like belief in the enterprise. It becomes more than an ordinary public celebration, thus, bearing on the face of it the need of special qualities of social sympathy in the director, and a sincere desire to aid the prosperity of the community in which he organizes it.

With the initial committee in the community organized, and the ways and means seen clear for the support of its efforts, subcommittees are formed for the organization of such groups as will portray historic episodes in the production, episodes illustrative of the industrial life of the place, and the further incidental scenes of a symbolic or lyrical nature usual in these pageants. A special committee takes charge of the costumes and properties, and another of arrangements for orchestral and vocal support to the performance.

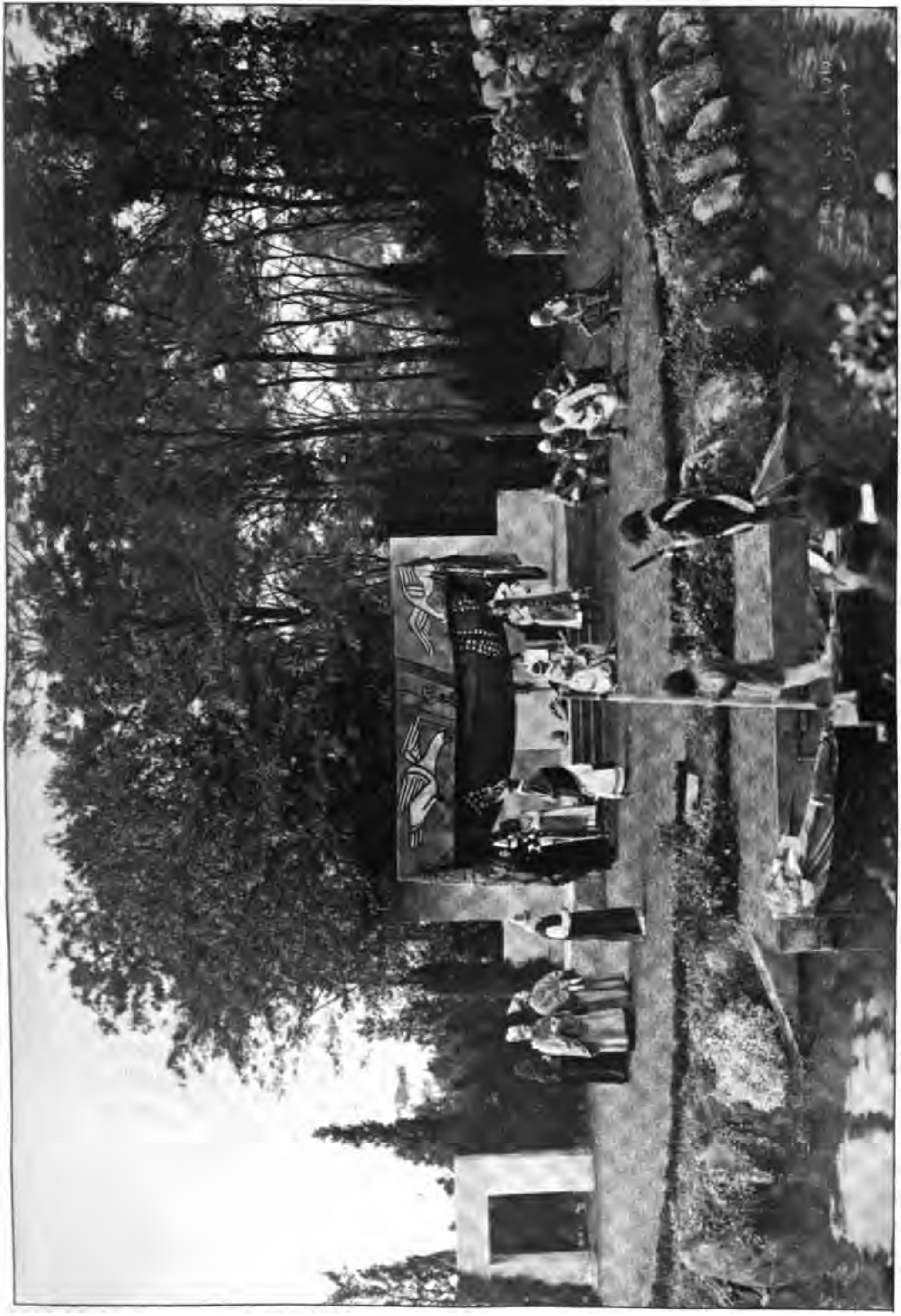
In the notable pageants of this kind in this country, the director-in-chief is most frequently the author of the book and as well of the layout for production altogether, and sometimes of the music scheme, even if not the composer of the full score. For working out the detail special talent is engaged as a rule, and so far as possible this talent is called upon in the locality where the production is to be, since it is part of the object of these pageants to stimulate preferably, local abilities by giving them the opportunities the festival presents.

The performers are always local persons, in this representative type of pageantry, if the artists on the producing staff may not be always so. It has been the special aim of the pageant producers in these cases to inaugurate and maintain a strongly local social feeling in the preparation of their pageants, in order to make them peculiarly an expression of the *esprit de corps* of the townsfolk, recreationally and as to sympathetic interest and pride in their history, their industries and especially in the possibilities of their community in the matter of prosperity and growth. The representation through pageantry of the pioneer enthusiasm expended by their ancestors in founding a community, is employed to inspire its modern members with renewed confidence in their natural heritage of energy,— while spirited reproductions of scenes from their own current industrial life, encouragingly sum up their accomplishment, and its promise of prosperity.

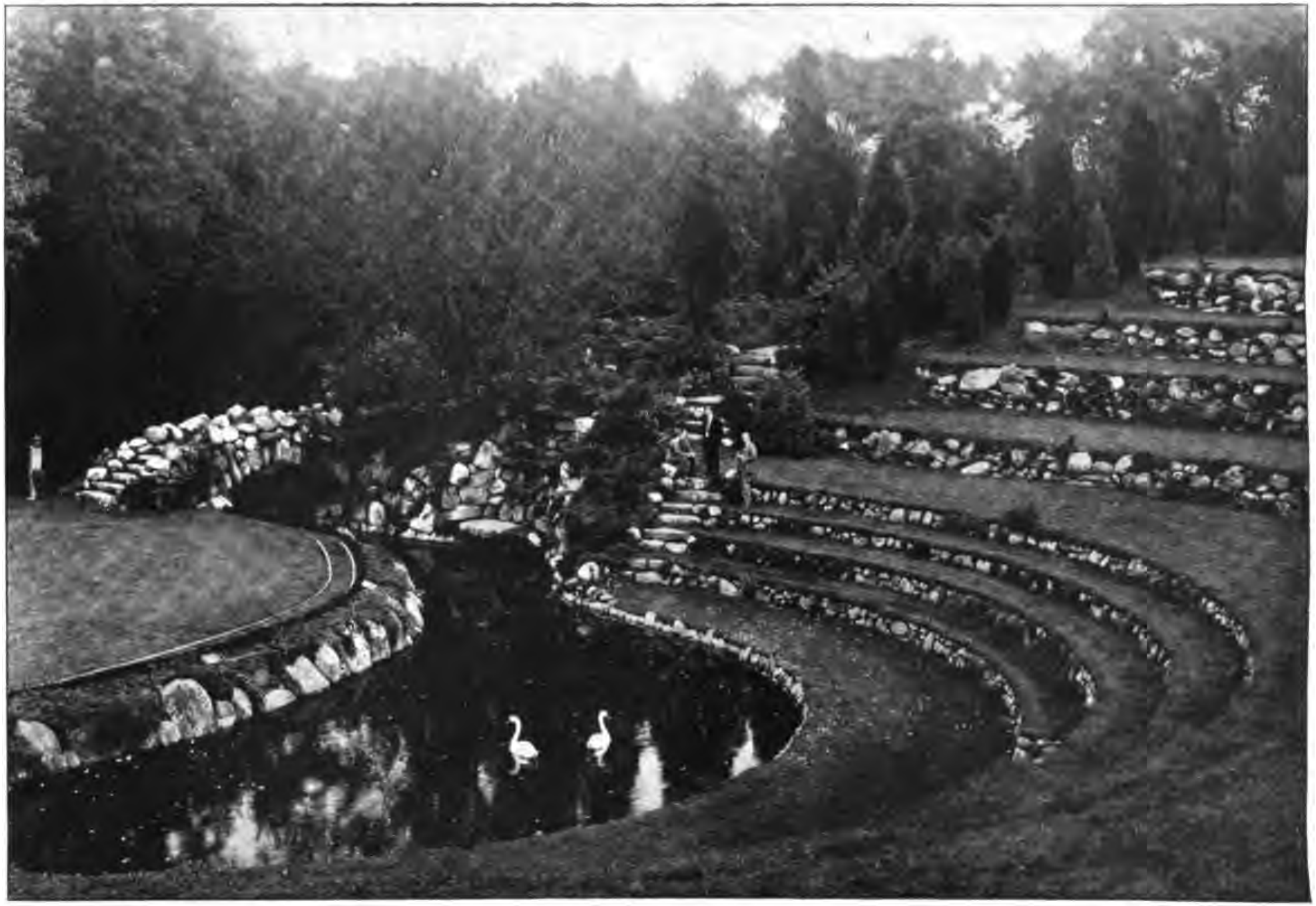
In the small country communities where this recreational and educational festival has been tried, the people participating have been farmers and hardworking folks for the most part, but their rehearsals for their production have been enthusiastically attended and carried on, and have proved a source of social enlivenment for the two months or so required for them. Great interest has been taken in these cases, in the preparation of costumes and properties, in the unearthing of heirlooms and old possessions for use in these capacities, and, among the actors, in the reproduction of the life scenes in which they knew their own ancestors were actually the original participants. In such ways the pageantry produced in the rural districts and small country towns has had an intimate interest it has not had in the large urban communities — and similarly in the rural districts it has responded to a more unique need, a hunger for social enlivenment and need of industrial energizing.

William Chauncy Langdon, who has been a notable pioneer in the rural application of pageantry in this country — with those of his colleagues who have followed his example — has made it in noteworthy instances, actually an altruistic application of the arts to social improvement, in a most comprehensive sense. His work is thus under the head of purely amateur enterprise, in the best sense. It will be seen that the emphasis relative to its usefulness must be laid upon its ethical impulse, and the effect of this upon the public spirit in the place

PAGEANTRY



Scene from the Stevens pageant, Rose Mary Garden Theatre, Huntington, L. I., showing fine sample of well-selected background, and fine spacing of groups for out of doors, also proper and beautiful uses of artificial adjuncts, and well-used water approach in the action



Out-of-door auditorium and part of stage space, banked and beautified by appropriate natural means, of the Rose Mary Garden Theatre, Huntington, L. I. It shows an excellent arrangement of water-course to be used in the action of the Red Cross Pageant of Thomas Wood Stevens of its production, rather than upon its features as a spectacle, or even as an artistic object lesson, although these pageants have served to discover and inspire local talents in the arts, in many instances, and by reason of expert and sympathetic direction of local amateur talent, have often resulted in artistic, and not alone ethical object lessons. They have been not crude, but excellent and beautiful in effect.

Relative to its technical form, the most noteworthy models have been arranged in general after the plan of structure of all the main types of pageantry, as established already in England, though varied and modified to fit local material to be illustrated by them, and according to the taste of the director.

The usual outline of structure is as follows:

A.

A Herald presents a prologue, and enters thereafter between scenes to recite introductory or explanatory matter, fulfilling the function of a Greek chorus.

This herald is sometimes replaced by a chorus like that in Greek drama, which introduces the explanatory matter either directly through the words of songs, or symbolically through dance evolutions, or tableaux.

B.

The herald is often succeeded by a lyrical prelude of dance and music, the dance usually of the modern "Interpretative" order, symbolic of the subject of the pageant it introduces. Occasionally where it has been appropriate to the historical subject matter, folk dances or other conventional dances are introduced as prelude or interludes.

C.

The *First Episode* proper now takes place, following one or both of these introductory passages. It is usually a directly dramatic scene presenting some representative historic incident of the period or periods which contribute subjects to the pageant. Such incidents often focus about the person of a famous individual of the period or the locality which the pageant celebrates.

D.

The further dramatic scenes of the pageant follow in their order, to the conclusion, with usually lyrical symbolic interludes between each two of them, or some introductory recital by the herald, as has been stated. Sometimes the interludes are varied from the allegorical, fanciful type, and are constituted of scenes illustrative of the industries of the place, and their progress from early times. This would be in cases where the industrial development of the place was incidental to a main historical theme, and not in itself the main theme.

E.

The *finale* is tableau, epilogue, by herald, lyrical passage; one or more of them, in which are summed up in allegorical or at least poetic form, the main theme and moral, that is, the concluding argument, presented by the whole spectacle. *A march past* of all characters is also a frequent feature of the *finale*.

A certain unity of plot is preferably regarded in the plan of the successive dramatic scenes, a given relation of them to the theme or moral to be developed through the agency of the production. It has been the aim of the leading pageant producers to create a standard in the structure of these compositions. The American Pageant Association (see footnote) has aimed particularly to educate those who wished membership in its body, in the technical understanding of such dramatic planning of structure and detail as should make the pageants they produced distinctly artistic compositions, and not loose processional or panoramic affairs, with parts ill related to each other or to any concrete central theme. This artistic consistency and unity is regarded by the specialists in pageantry, in the production of no matter what type of pageant they present under the several heads in the technical classification they employ, a classification in which the main types are termed: Panoramic pageant, dramatic pageant, epic pageant, pageant drama, dramatic festival, lyrical drama. The detail of distinctions among these is mainly useful to specialists, but briefly they may be stated as follows:

A Panoramic Pageant consists of a long series of scenes and incidents, depicting historical developments, and not strongly focused about one main event.

A Dramatic Pageant is focused about some main event and the moral to be deduced from it, and is more concrete accordingly in its form.

An Epic Pageant deals with some particular epic event and is treated romantically rather than with any emphasis on an ethical theme. In form it may be like the preceding, or still more concrete and focused on personal action and special period, as is the following —

Pageant Drama: A drama on a grand scale with a heroic and romantic theme, and produced with the spectacular features of pageantry, that is, splendor of group masses and broad lines of action throughout its scenes.

A Dramatic Festival is one in which spectacular features, dances, choruses, tableaux, etc., are co-ordinated in poetic or allegorical illustration of a chosen subject; or it is a celebration of the spirit of some holiday in such form as presents a well-composed spectacle, and does not consist of mere loose features in a haphazard merrymaking.

A Lyrical Drama may be defined as one with dramatic theme and central action, but conveyed in poetic forms of discourse and song, and having its main features threaded, so to speak, upon choric passages, that is, passages of dance scenes, symbolic tableaux and group movements, and the like.

As to the theme of the usual pageant, which is of the historical and community improvement or educational order, it may be summed up as the moral and promise to be deduced from local or general history and from the special activities, political, industrial or educational of a place or epoch.

Pageantry in the United States and England during the period of its coming into such conspicuous recent popularity, peculiar specialization and application to community improvement has been used in this country and England to illustrate and improve local agriculture, manufacturing, commerce, arts and education. Pioneer life in our country has been a favorite theme, and incidents of the early settlers' contact with the Indians are introduced into most of our State historical pageants. (A reference to the specification of subjects in the lists of pageants in the foregoing article PAGEANT will indicate representative productions illustrating these several themes.) Pageantry is at its best out of doors, and the most noteworthy pageants of the local history type have been produced so. Certain types of pageantry, given indoors, would rather come under the head of epic dramas, heroic dramas on a grand scale, for as a rule, given in the limited setting of a theatre they are more appropriately composed in the more concrete dramatic forms. If, indoors, they yet have the character which is specifically one of pageantry — that is, the carrying of the plot or theme predominantly by group action, rather than the action of individual persons — they come properly under the head of pageantry, but in the classification of pageant-drama defined above, for they have in such case the features of both forms of composition.

A word relative to choice of special site for an out-of-door pageant will be practical for would-be producers.

A producer must have in mind the necessity of mutual adaptation of site and production to each other, and out of doors a site cannot be made to order to any great extent, and so must, so far as possible, be *found* to order. It is to be realized especially in selecting a site that in order to properly enclose the scene pictures, the choice should be made of space which is some approach to an amphitheatre in form. It needs at least, at a suitable distance from the central action space, sloping ground, or background, and if possible side-fringe of trees, rising ground or rock wall — something to give it frame and modified distribution of light to set off the action and aid effective entrances and exits.

Some body of water, a stream or pool, is apt to be indispensable to certain scenes of almost every out-of-door pageant. In country districts a site combining these needs to a sufficient extent is usually possible to find. Production in other localities, large outdoor arenas, athletic fields, etc., may require artificial aids to the spectacular effects. The more artificial aids may be dispensed with, however, the better for the beauty of the outdoor production in every case. A wooden platform is an abomination out of doors, as also are artificial scenery pieces. If such must be used, a camouflaging of leafage should be employed to conceal their unreality which in the open air is wholly devoid of the illusion with which indoor lighting softens it.

The choice of colors for out-of-door productions is also one requiring special study given it in every instance. More brilliant colors and combinations may well be used out of doors and at the greater distances covered than are permissible indoors. The effects of light and shadow in a special site, should be considered and utilized in grouping and in application of color schemes. The effects of distances in the scene space, relative to the action of groups and individuals, must be experimented with by the director. No outdoor site may have the rules of the indoor theatre applied to it without modification and special adaptation. The matter of acoustics is also an important one out of doors. Because the use of the voice out of doors is more difficult than indoors, the lines of pageantry are as a rule reduced to their simplest possible compass, enough to carry the needed information and little more. But this must be done with good dramatic speech, with as much beauty as possible in language. But particularly is it necessary to remember that a strictly rhythmic prose, or a well-turned pentameter verse will enable a speaker to make his voice carry out of doors, with more ease than lines written without regard to rhythm or the quality and juxtaposition of syllabic sounds they contain. This presents another problem for the writer of a pageant book, for the new pageantry which is to maintain an artistic standard of composition and production. It is well wherever possible to plan the action on a pageant site where the natural background of wooded land, rocks or walls may be made available as a sounding board for what dialogue enters the scenes, for the recitations of the Herald, or the singing of the choruses. If nothing whatever is naturally provided in the available locality, artificial backgrounds for this purpose may be erected, but should always be camouflaged with such effects as will relate them beautifully or appropriately to the setting which nature provides. The actor as well as the playwright has a problem here in the use of voice in the open air, for speech. An utterance not too quick, with precise regard to rhythm in phrasing, and to rounded tone, is essential. It is for this reason that for important character rôles in pageantry and outdoor plays, professional actors are sometimes indispensable, or a risk of loss of the dialogue to the audience is incurred. But the director who is experienced or who will experiment with care in each new site, can aid clever amateurs to properly deliver their dialogue, or will know whether it can only be properly delivered by a professional actor who can adapt himself to difficult acoustics in a site where they are imperfect and cannot be improved. English pageantry is notable for its substantial magnificence of spectacular effects and costuming, and as a rule, for a higher literary type of book than our American pageantry — as yet. With more finish in this last respect, and with the adaptation of a more solid magnificence like that of the English pageantry, added to the theatric aptness in attaining picturesqueness and telling action which our own producers show on occasions, a highly artistic type of heroic, dramatic and spectacular composition may be developed from our American Pageant forms as they are now constructed and produced by their representative directors and the authors and composers who contribute to them. Consult Craig, A. T., 'The Aesthetic of an Outdoor Play' in *Drama* (May 1918). See PAGEANT.

FOOTNOTE.— The American Pageant Association was formed in 1911–12, for the express purpose of bringing together teachers, dramatic writers and producers, social settlement directors, and playground leaders, who were interested in this valuable form of elaborating their recreation periods, in schools or community centres, in sociological work in larger civic fields, or in producing entertainments for artistic education, and so on, that they might give each other the benefit of their several experiments in the development of this form of dramatic production and its kindred forms, technically, and as to working organization, that is, as an art, and as an educational social force. Its founder and president was William Chauncy Langdon. Its first members were: Percival Chubb, Peter W. Dykema (now of Saint Louis and University of Wisconsin, respectively), Percy Mackaye, Thomas Wood Stevens, Canstance d'Arcy Mackaye, Hazel Mackaye, Elizabeth Hoar, Charles Farnsworth and Mrs. Charles Farnsworth (of Teachers College), Frank Chouteau Brown, Lotta Clarke, William E. Bohn, Anne Throop Craig.

ANNE THROOP CRAIG.

PAGET, păj'ĭt, SIR **James**, English surgeon: b. Great Yarmouth, Norfolk, England, 11 Jan. 1814; d. London, 30 Dec. 1899. He studied in Saint Bartholomew's Hospital, London, became a member of the Royal College of Surgeons in 1836, and a fellow in 1843. He was a corresponding member of the Institute of France. He was consulting surgeon at Saint Bartholomew's Hospital, and sergeant-surgeon to the queen, and was created a baronet in 1871. He was vice-chancellor of the University of London, president of the Royal College of Surgeons, and delivered many important lectures on his surgical work. He discovered the cause of trichinosis in 1836, and made great advances in the study and treatment of tumors, of diseases of the bones and joints, and neurotic cases exhibiting surgical symptoms. He also contributed to the advance of physiological research. A disease of the breast and osteitis deformans, a bone disease, are known after him. He published 'Lectures on Surgical Pathology' (1853); 'Clinical Lectures' (1875); etc.

PAGET, Violet («Vernon Lee»), English essayist and critic: b. 1856. Since 1871 she has made her home in Italy, devoting herself in the main to the study of Italian art and literature. She is a brilliant though not always a convincing writer, fluent and discursive, and not infrequently subtle as well, and possesses the power of holding the reader's interest, no matter what subject be chosen. Among her works, all of which have appeared over the signature of «Vernon Lee,» are ‹Studies of the 18th Century in Italy› (1880); ‹Belcaro: Essays on Sundry Æsthetical Questions› (1882); ‹Ottilie: an 18th Century Idyll› (1883); ‹Euphorion,› essays (1884); ‹Miss Brown,› a novel (1884); ‹Juvenilia,› essays (1887); ‹Renaissance Fancies and Studies› (1895); ‹Limbo,› essays (1897); ‹Genius Loci› (1899); ‹Hortus Vitæ: Essays on the Gardening of Life› (1903); ‹Genius Loci› (1905); ‹Pope Jacynth› (1905); ‹The Enchanted Woods› (1905); ‹The Spirit of Rome› (1905); ‹Sister Benvenuta› (1906); ‹The Sentimental Traveller› (1907); ‹Gospels of Anarchy› (1908); ‹Laurus Nobilis› (1909); ‹The Tower of Mirrors› (1914); ‹Louis Norbert› (1914).

PAGO, pä'gō, island of the Adriatic in the bay of Quarnero and district of Zara, Dalmatia; an Austrian possession. The canal of Morlacca separates the island from the mainland. Area, 81 square miles; pop. 7,000. The capital city, bearing the same name, lies in the deep Vallone di Pago, which is hemmed in on every side save where the Bocca di Pago gives approach; the city has important saltworks and a population of about 4,000.

PAGO-PAGO. See Pango-Pango.

PAGODA, păg'ō-dạ, a word of antique Persian origin meaning an idol-temple. It is now applied to almost any building in India, Burma or China, having a tower-like form and built for religious or memorial purposes, as, for example, a Buddhist tope, or one of the highly ornamented, bell-shaped dagobas of Burma. In its properly restricted sense, however, the pagoda is a form of tower peculiar to China and indicative of the ancient nature-worship that has given way only superficially among the common people to the imported doctrines and services of Buddhism, Islam and other introduced cults.

These beautiful towers are scattered all over the empire in thousands and are the most characteristic feature of the landscape; but in southern China great numbers were destroyed in the wars of the last century. They are always polygonal, have massively thick walls intended to last for centuries, and invariably have an odd number of stories, in some cases as many as 13, and rising to a height of 200 feet. The material is usually brick, but sometimes cut-stone is used, and each story is indicated by a projecting roof-like structure, curving upward at the eaves, and hung with bells or other pendants. These eaves give the whole an appearance of a pile of tile-roofed houses terminating in a peaked roof. Pagodas are usually highly ornamented and often are covered with glazed and colored slabs of potteryware, rarely with metal. The celebrated porcelain pagoda of Nanking, destroyed from superstitious motives by the Tai-ping rebels in 1853, was very high, and was faced with blocks of fine blue porcelain.

The interior of a pagoda may contain statues and figures of mythical deities and thus have the significance of a temple, or it may be erected as a memorial of some great man or event and furnished only with descriptive tablets. Every one has been built by private munificence.

The idea prompting the erection of most, if not all pagodas is religious, standing in close connection with *feng-shui* (literally, wind and water), the strongest of Chinese doctrines or superstitions, for they exert, as the people believe, a most powerful influence in controlling certain supposed currents in earth and air, which are held to be important agents in modifying for better or worse climate, crops, health and even the ordinary actions of man. It was fear of this geomantic influence, possibly hostile to their plans, that led to the pagodas being thrown down all along the Yang-tze Valley by the Tai-pings, so that only a single one of importance now remains near that river.

PAGSÁN, päg-sän', a mountain on the island of Luzon in the Philippines, a peak of the Cordillera del Norte, on the intersection of the boundaries of Ilocos Sur, Cagayan and Ilocos Norte provinces; height, 7,330 feet. At Pagsán a spur leaves the main range, which forms the boundary between Ilocos Sur and Ilocos Norte. The southern slopes of Pagsán are drained by the Anayan and the Calúan, which unite to form the Tinog River, a tributary of the Abra.

PAGURUS, or PAGURIDÆ. See Hermit-crabs.

PAHANG, pä-häng', Indo-China, one of the federated Malay states under British protection, on the east coast of the Malay Peninsula, between 2° 28' and about 4° 50' N. and 101° 30' and 103° 30' E., to the north of Negri Sembilan and Johor, east of Perak and Selangor, south of Kelantan and Trengganu and west of the bordering China Sea. The state is 210 miles long, 130 wide, with 112 miles of coast and an area of about 15,000 square miles. It takes its name from the Pahang River, which drains the region and is navigable for large river boats 200 miles from its source, but too shallow for commerce of importance. Pahang in ancient times was called Indrapura. It was ruled by the Siamese until the 16th century; then by refugees from Malacca, who founded a royal line, between the members of which there was bitter war in 1855–65. In 1887 a treaty was signed with the British governor of the Straits Settlements; in the following year a British resident was appointed to protect British interests, but disorder broke out again and was only quelled by the armed interference of the Straits governor; in 1895 Pahang joined the Malay Federation. The state is fertile with regular and sufficient rains and is cooler than the western coast of the peninsula. The important industry of Pahang is gold-mining; the Raub mine and other lodes along the river are successfully worked by European capital; electricity is carried to the mines seven miles distant by overhead wires. The population is about 90,000; 134 being Europeans and Americans; about 70,000 Malays and aborigines of other stocks; the rest Chinese and Hindus, especially Tamils. The capital is Kuala Lipis; there are four administrative districts.

PAHARIA, or **MALER,** a northern section of the Dravidian race, inhabiting the Rajmahal Hills, Bengal, India. See DRAVIDIAN.

PAHLANPUR, or **PAHLUMPUR.** See PALANPUR.

PAHLAVI (pä'lą-vē) or **PEHLEVI LANGUAGE.** See PERSIA, LANGUAGE AND LITERATURE.

PAHLEN, pä'lĕn, **Peter Ludwig,** COUNT OF, Russian statesman: b. Palms, Esthonia, 28 April 1745; d. 1826. He fought in the war with Prussia (1761–62), against Turkey (1769) and against Sweden; was ambassador to Sweden (1790); was governor-general of Courland (1795) and later of Finland: was made a Russian count in 1799 and Prime Minister, Foreign Minister and military governor of Saint Petersburg in 1800. These high offices he used to further the conspiracy against the Tsar Paul I, which resulted in the assassination of that monarch in 1801. Alexander I distrusted Pahlen and retired him. His son, PETER (1778–1864), a great Russian general, fought in Asia in 1796; against the French 1812–14; and in Poland in 1831. He was Russian Minister to Paris from 1835 to 1841. His younger brother, FREDERICK (1780–1863), was Minister to Prussia, to Rio Janeiro and to Munich, a signatory of the Treaty of Adrianople in 1829 and later governor of Kherson.

PAHOEHOE, a Hawaiian term used to describe moderately smooth to billowy lava surfaces, as contrasted with the roughly craggy and cindery types known as aa.

PAILLERON, pä-yĕ-rôṅ, **Edouard Jules Henri,** French dramatist: b. Paris, France, 17 Sept. 1834; d. there, 19 April 1899. He was a clerk in a notary's office until 1860, when his first work, a volume of satirical poems and a play, was published, after which he devoted himself to literature. His plays, written in both prose and verse, attained considerable popularity. He was elected to the Académie Française in 1884 as a result of the success of his 'Le Monde ou l'on s'ennuie' (1883). Among his plays are 'Le Mur mitoyen' (1861); 'L'Age Ingrat' (1879); 'La Souris' (1887), etc.

PAIN, Barry, English humorous author and journalist: b. 1867. He was educated at Cambridge, was for a time an army tutor and in 1890 removed to London. He has published 'In a Canadian Canoe' (1891); 'Playthings and Parodies' (1892); 'Stories and Interludes' (1892); 'Graeme and Cyril' (1893); 'Kindness of the Celestial' (1894); 'The Octave of Claudius' (1897); 'Wildmay and Other Stories of Women' (1898); 'Romantic History of Robin Hood' (1898); 'Eliza' (1900); 'Anothet English Woman's Love Letters' (1901); 'The One Before' (1902).

PAIN, a sensation felt in animal bodies, always disagreeable and varying in degree from a slight uneasiness to intense agony. It is a very important sign in some diseases and is nearly always associated with an inflammation, an ulceration or a solution of continuity in some of the tissues of the body. But in health also certain sensory stimuli, the general tendency of which is hostile to the welfare of the organism, are capable of producing pain. Griesinger stated that the essence of pain lies in a disturbance of the organization of the nerve at some point in its course. It has, however, been shown that pain is a distinct sensation, not to be confused with mere unpleasantness and on the skin localized in spots not sensitive to pressure or temperature. Those parts of the body which are most subject to injury are supplied with nerves in the largest quantity.

Were it not for sensibility to pain, important parts of the body might be irreparably injured without the knowledge of the individual. This sensibility undoubtedly differs in degree in both men and animals. Persons of a highly excitable temperment usually feel pain intensely, especially if they are predisposed to neuralgia. Pain is called acute, when sharp and violent; lancinating, when of a stabbing or darting character; lacerating, when there is the sensation of tearing; burning, when it resembles the pain of a burn. Pains are also distinguished as smarting, stinging, griping, bearing-down, gnawing, biting, etc. These differences do not reside in the quality of the sensation of pain itself, which is uniform, but in the concomitant sensations. The degree of pain is not always in proportion to the gravity of a disease and may be masked by other symptoms in a severe affection. Extensive ulcerations may occur in the stomach and intestines, for example, attended with very little pain. Cartilage is believed never to be the seat of pain. Pathological changes in insensitive parts of the body, however, may cause pain. Pain is frequently sympathetic or reflex, occurring in a portion of the body remote from the seat of disease or irritation; for example, in disease of the hip-joint pain is felt in the knee. The feeling of pain is always referred to the periphery of the sensory fibres, no matter what portion of the sensory tract has been irritated. "Lesions of the brain are rarely accompanied by sensation in that organ, but often by severe pain referred to the extremities." Under certain conditions the sense of pain may be lost independently of the other sensations.

While pain is but a symptom, it should, if possible, be relieved, though the cause may not be removed. Painful sensations are associated with a depression of the circulation. Pain exhausts nervous energy, interferes with sleep, interrupts the appetite and digestion, and if long continued may shorten life. For treatment, remove the cause, enjoin rest, apply locally hot water or poultices, sinapisms, counter-irritation, and anodyne linaments. Anodyne or narcotic drugs, although of value, should be used cautiously. Regulation of the diet and attention to the condition of the bowels is important.

PAINE, Albert Bigelow, American author and editor: b. New Bedford, Mass., 10 July 1861. He was educated in the public schools of Xenia, Ill. From 1899–1909, he was editor of the League department of *Saint Nicholas Magazine*. Among his works are 'Rhymes by Two Friends' (1893); 'The Autobiography of a Monkey' (1897); 'The Bread Line' (1900); 'The Ship Dwellers' (1910); 'Mark Twain: A Biography' (1912); 'The Boys' Life of Mark Twain' (1916); Mark Twain's Letters' (1917).

PAINE, Charles Jackson, American sportsman: b. Boston, Mass., 26 Aug. 1833. He was graduated at Harvard College in 1853 and entered the army as captain of the 22d Massachusetts infantry 8 Oct. 1861. He served with distinction during the Civil War; was appointed brigadier-general of volunteers in 1864; and in 1866 was brevetted major-general. He became prominent as a yachtsman. The *Puritan, Mayflower* and *Volunteer,* owned by him, were successful defenders of the America's cup.

PAINE, John Alsop, American archæologist: b. Newark, N. J., 1840; d. 1912 He received his education at Hamilton College and at Andover Theological Seminary. He conducted botanical work for the board of regents of the State of New York in 1862–67 and in 1867–69 held the chair of natural science at Robert College, Constantinople. In 1872 Paine was archæologist to the expedition sent out to the district east of the Jordan by the Palestine Exploration Society. In 1889–1906 he was curator of the Metropolitan Museum of Art in New York City.

PAINE, John Knowles, American organist and composer: b. Portland, Me., 9 Jan. 1839; d. Cambridge, Mass., 25 April 1906. In 1858–61 he studied in Germany, in 1862–73 was instructor in music at Harvard and in 1875 became professor of music there. He composed the music for the 'Œdipus Tyrannus' of Sophocles, as performed in the original at Cambridge in 1881; the 'Centennial Hymn' to Whittier's words for the Exhibition at Philadelphia in 1876, and the Columbus march and hymn of the World's Columbian Exposition of 1893. Among his further works are the opera 'Azara'; 'Spring Symphony'; the cantatas, 'The Nativity' and 'The Song of Promise'; choruses to Aristophanes' 'Birds'; symphonic poems; music to the 'Tempest'; and an overture to 'As You Like It.'

PAINE, Martyn, American physician: b. Williamstown, Vt., 1794; d. 1877. In 1813 he was graduated at Harvard and from 1816 to 1822 practised his profession af Montreal, Canada. In the latter year he removed to New York City. He was one of the founders of University Medical College in 1841, which afterward became the medical department of New York University, and where Paine was professor of medicine and materia medica in 1841–67. He published 'Cholera Asphyxia of New York' (1832); Medical and Physiological Commentaries' (1840–44); 'Institutes of Medicine' (1847; 9th ed., 1870); 'Review of Theoretical Geology' (1856).

PAINE, Robert Treat, signer of the Declaration of Independence: b. Boston, 11 March 1731; d. there, 11 May 1814. He was graduated at Harvard at 18, studied theology, was chaplain to the New England troops in 1755, and in 1759 was admitted to the bar and began to practise law in Boston. He represented Taunton in 1768 at the convention called to discuss Sir Francis Bernard's dissolution of the general court; conducted the prosecution of Preston and his men for the Boston Massacre (1770), and the impeachment of Peter Oliver for receiving money from the king and not from the colony; served in the general assembly of the State (1773–74), in the Provincial Congress (1774–75), and in the Continental Congress (1774–78), being a signer of the Declaration and a member of various important committees. He was a delegate to the State convention of 1779, which adopted a constitution; was attorney-general of Massachusetts (1780–90); and sat as judge of the Supreme Court (1790–1804). Consult Sanderson, J., 'Biography of the Signers of the Declaration of Independence' (Philadelphia 1823).

PAINE, Robert Treat, American poet, son of the preceding: b. Taunton, 9 Dec. 1773; d. Boston, 13 Nov. 1811. His baptismal name, Thomas, was changed in 1801 by act of Legislature, that he might bear his father's name and not that of the famous deist. He was graduated at Harvard in 1792, was then in business for a time, but devoted most of his attention to journalism and poetry. His journal, the 'Federal Orrery,' was given up after two years. His marriage with an actress in 1795 shut him out of Boston society and alienated his father. The son practised law with some success and much brilliancy, but he soon fell into wayward courses and died in poverty. His best known poems, which were popular, but practically without value, were 'The Invention of Letters,' delivered at Cambridge in 1795; 'The Ruling Passion' (1797); the patriotic song, 'Adams and Liberty' (1798); and the bitter political poems, 'The Jacobiniad' and 'The Lyars.'

PAINE, Thomas, political and religious radical: b. Thetford, Norwalk, England, 29 Jan. 1737; d. New York, 8 June 1809. His father was a Quaker staymaker. Paine thought of being a sailor, and made one small voyage, then was a staymaker at Sandwich, Kent, a tobacconist at Lewes, Sussex, and an exciseman. He was discharged from the excise in 1765, but three years later received another appointment at Lewes, Sussex, being dismissed in 1774. In London he met Franklin who gave him letters of introduction to leading men in America. In 1774 he separated from his wife, for causes that are not clear, and came to America, arriving in Philadelphia in December 1774. Here he became the editor of the *Pennsylvania Magazine* for 18 months. Hostilities having commenced between the mother country and the colonies, Paine wrote his well-known pamphlet, 'Common Sense' (1776). The object of this pamphlet, written with much vigor, was to recommend the separation between the Colonies and Great Britain. After war was declared he gave up his position on the magazine and joined the staff of General Green. In 1777, while with the army, he wrote the first of a series of political appeals called the *Crisis,* the first number of which started with the words, 'These are the times that try men's souls.' This was written at a time when the American cause seemed lost. But in every village and city in the colonies, the burning words of Paine, which were also ordered read to the army, aroused new courage. Other numbers of the *Crisis* were published at short intervals. He left the army to become secretary to the Committee of Foreign Affairs. In January 1779 he resigned from his secretaryship because of a controversy with Silas Dean, whom Paine accused of attempting to profit by his agency by conveying secret supplies from France. But in November of the same year, the State of Pennsylvania testified that it approved of Paine's position in this matter, by appointing him clerk of the assembly. While clerk on a salary of $2.500 he started the subscription which resulted in the forming of the Pennsylvania Bank (later known as the Bank of North America). In 1785 Congress, in recognition of his services during the war, voted to him the sum of $3,000. The State of New York also gave him 300 acres of land in New Rochelle. In 1787 he embarked for Europe, carrying with him his model of his iron bridge, on which he had spent many years. He went first to Paris, and then to England. On the appearance of Burke's 'Reflections on the French Revolution' he wrote the first part of his 'Rights of Man' in answer to Burke. The second part was published in 1792, and on the 21st of May of that year the government issued a proclamation against wicked and seditious publications and, though not naming, alluded to the 'Rights of Man.' On the same day the attorney-general started a prosecution against Paine. Paine escaped into France where he was chosen a member of the National Convention, by two districts of France, and became the member from Calais. In the convention he became one of the leading figures. At the trial of Louis XVI he voted against the sentence of death and urged that the king be imprisoned and then banished to the United States. This conduct offended many, and in 1793 he was excluded from the convention on the ground that he was a foreigner (although he had been naturalized). He was arrested and committed to the Luxembourg. Just before his confinement he had finished the first part of his 'Age of Reason' on which he had been working for years. This he gave to a friend, Joel Barlow, and it was published in London and Paris in 1794. On the fall of Robespierre he was released from prison, after a narrow escape from death, and again took his seat in the convention. In 1795 the second part of his 'Age of Reason' was published, and the third part in 1807. 'The Age of Reason, being an Investigation of True and Fabulous Theology' created the greatest stir of any book of its time. It caused a change in the public feeling toward him, and lost him his friends in America. Considered at that time a bitter attack upon religion, it is seen to-day that it only presented the deism of the 18th century. In May 1796 he addressed to the Council of Five Hundred a work called 'The Decline and Fall of the System of Finance of England,' and also published a pamphlet, 'Agrarian Justice.' In October 1802 he arrived again in America, after a controversy with Washington, landing at Baltimore. He found that his former friends had turned against him, and that his 'Age of Reason' caused him to be looked upon with suspicion. For some years he lived on his farm at New Rochelle He died in New York 8 June 1809, and was buried on his own farm. In 1819 his bones were taken to England by William Corbett, but were refused burial, and were scattered throughout the land. Paine has received such strong extremes of praise and execration that it is hard to form a clear picture of the man. The only source of unbiased information regarding him must be found in his own writings. He took a leading part in the political affairs of at least two countries, France and the United States, and was a deep lover of liberty. He possessed much native vigor of intellect and was a writer with a spirited argumentative style. Washington, Jefferson, Franklin and Randolph have praised highly his efforts and contributions to the cause of the colonies. It might be added that but for his attacks upon religion, Paine's position would be higher. But his 'Age of Reason,' unscholarly as it was, in many ways broke ground for the serious biblical criticism that was to come. It was written not to attack religion but, in his own words, "to show a higher form of religion." Paine was not an atheist, as has been popularly believed, nor are the popular stories of his drunkenness true. His services to the American cause were lasting and important. The political pamphlets, letters and addresses of Paine, which were many, may be found in his works. Conway published the best edition of Paine's works in 1893–96. The earlier lives of Paine, 'The Life of Thomas Paine,' by James Cheetham (New York 1809), 'The Life of Thomas Paine' by Francis Oldys (London 1791) are marked with bitter hatred for Paine and do not give a true picture of his life or works. The 'Life of Thomas Paine' by M. D. Conway (1892), is the standard. Consult his works, edited by M. D. Conway, of which there are several editions; also Taylor's 'Literary History of the American Revolution' (1896).

PAINESVILLE. A city 29 miles northeast of Cleveland, Ohio, the county-seat of Lake County, connected by the Lake Shore and Michigan Southern, the New York, Chicago and Saint Louis and the Baltimore and Ohio railroads and by electric lines to Ashtabula, Fairport and Cleveland. It contains many industrial establishments, a grain elevator, flour mills, iron foundries, machine shops and brick yards. The municipality owns and operates its own waterworks and electric plants for lighting the town. It receives considerable commercial importance from the fact that Fairpoint, making a fine natural harbor on Lake Erie, is but three miles away. The town boasts of a large public library, containing over 5,500 volumes, and a non-sectarian college for women (Lake Erie College) which dates as far back as 1859. The town itself was founded in 1800–1802, but was not incorporated before 1832, receiving its present charter as late as 1902. The rich agricultural and mining region in which Painesville is situated contributes considerably to its prosperity. Pop. 5,501.

PAINLEVE, pān'lĕ-vā', **Paul,** French mathematician, scientist and statesman: b. Paris 1863. He studied at the École Normale Supérieure 1883–86, graduating docteur ès sciences in 1887, the same year being member of a mission to Germany. From 1887–92 he was instructor in mechanics at the University of Lille, became lecturer at the Sorbonne, from 1895 to 1903 taught mathematics at the École Normale, was appointed professor of mathematics at the University of Paris and later at the Polytechnique. In 1900 he was elected a member of the Institut. In October 1915 Briand appointed him Minister of Public Instructions and Inventions for Public Defense and in 1917 he became Minister of War. His published works are ‹Leçons sur le frottement› (1895); ‹Leçons sur la théorie analytique desequations differentielles› (1897), and with Emile Borel ‹L'Aviation› (1910; German trans. 1911).

PAINS AND PENALTIES, Acts of. An act of legislation passed in England providing for the imposition of punishment without trial upon anyone clearly guilty of treason or similar serious crimes. No capital punishment, however, can be imposed under this statute. In the United States such legislation never has been enacted, nor ever could be, since there is a constitutional clause forbidding all bills of attainder.

PAINT. Coloring material prepared for coating a surface and thereby distinguished from dyeing or staining matter.

History.— The ancient full gamut of pigments consisted of: White, an earth from Melas; red an earth called *sinopis* (red ochre) from Cappadocia; yellow from the Attic silver mines; black, from charred plant life. Green appears next in their category brought from the copper mines; then followed the imperial purple of Tyre. White lead was used by the ancients, being found near Athens in form of a face powder in a pottery box dating from 400 B.C. Theophrastus, Pliny and Vitruvius give a description of its manufacture from lead and vinegar (as used to this day); it is later known as «minium album.» Yellow ochre was used by the Egyptians, Greeks and Romans; Theophrastus terms it «oichra.» Pots of it were found in the Pompeii ruins. Naples yellow, as a true antimonial yellow, is found in the yellow enamel of Babylonian bricks, 2,500 years old, and 13th century pottery of Persia contains such a yellow. Verdigris pigment (*viride Græcum*) was used by the Romans. Theophrastus, Pliny and Vitruvius show vermilion (cinnabar) was known in their day. Indigo has been used by the East Indians from very distant times and also by the ancient Egyptians; Pliny calls it «indicum.» The Chinese have been producing Indian ink for over 2,000 years.

Pigments: Their Nomenclature and Composition.— Pigments technically are dry substances, usually in pulverized form, or in lumps easily pulverized, which by the addition of a liquid medium, technically called a vehicle or carrier, are applied by painters to surfaces which it is desired to color. Pigments are properly restricted to the *dry* coloring matters which enter into the composition of paints but the word is frequently used as a synonym for paint. A pigment is therefore a «color,» the word «color» being used indiscriminately of a compound of various pigments, or of a ground pigment ready for the addition of the suitable oil or carrier. Thus in the commercial world the pigments put up in cans ready for use at paint stores are commonly termed «colors.» Strictly speaking, the term pigment should not be applied to any substance unless it has the inherent power of its own to impart color to other substances with which it may be mixed. Adjunct substances such as starch, glue, finely ground silex, quartz, etc., possessing no coloring matter of their own are often added to true pigments with no other purpose than that of adding weight without changing the original color of the pigments in combination and by some manufacturers are termed pigments although not entitled to the name.

In this article all pigments have been classed into groups of certain colors, and under each group are treated all which belong to it by being nearer in tone than to any other group. The whites are first considered as this group is the most important of all, nine whites form the base upon which nearly all tints are made by the addition of colored pigments. White lead is the best known and most important of the white group. Although known from ancient times it has only been manufactured on a large scale for a little over 200 years. The usual process employed in its manufacture is that known as the «Dutch process»— a chemical process in which there is produced the corrosion of the lead metal by the agency of dilute acetic acid fumes, carbonic acid, hydrogen, oxygen and heat.

WHITES.

White Lead.— Composed of about 75 per cent lead carbonate and 25 per cent lead hydroxide. «Dutch Process» is made by slow double corrosion in the presence of acetic acid (vinegar) and carbonic acid from fermentation of tan bark or dung. «Quick Process» is by direct action of acetic acid, the acetate of lead subjected to carbonic acid gas. The former is the better product.

Flake White (white lead, ceruse, blanc d'argent, blanc de plomb, Kremser Weiss).—A purified white lead.

Lead Sulphate (Freeman's white lead).— Little used on account of many defects.

Sublimed White Lead.—Composed of 75 per cent lead sulphate, 20 per cent lead oxide, 5 per cent zinc oxide.

Calcium Carbonate (Paris white, whiting, alba whiting, white mineral primer).— Very inferior for paints.

Zinc White (Chinese white, blanc de zinc, Zinkweiss).—An oxide of zinc, producing a very hard, brittle, vitreous surface.

Baryta White (permanent white, blanc fixe, Permanentweiss).— Made, as its name implies, from barytes.

Lithopone (oleum white, Beckton white, Charlton white, ponolith, Jersey Lily white, Orr's white).—A double precipitate of sulphide of zinc and sulphate of barium.

Sulphopone.— Similar to the last named but sulphate of calcium displaces sulphate of barium.

YELLOWS.

Yellow Ochre (Roman ochre, golden ochre, mineral yellow, brown ochre, Oxford ochre, ocre, jaune, gelber ochre).—A ferric hydrate. The mineral usually contains silica, gypsum, iron and copper purites as impurities.

Cadmium Yellow (Orient yellow, aurora yellow, orange cadmium, sulphide of cadmium, Jaune brilliant, jaune de cadmium, Cadmiumgelb).— Cadmium sulphide.

Aureolin (cobalt yellow, Jaune de cobalt, Kobaltgelb).— A compound of the nitrites of cobalt and potassium. Very transparent in oil or water color.

Lemon Yellow (baryta yellow, barium chromate, yellow ultramarine, permanent yellow, jaune d'outremer).

Gamboge (gomme-gutte, Gummigutt).— Yellow pigment of the gum resin *Garcinia*. A mixture of water-soluble gum and a resin soluble in alcohol, chloroform, etc. Unstable as water-color, but in oil (if a resin be added) appears to stand light.

Indian Yellow (piuri, purree, peori, jaune indien, Indischgelb).— Made at Monghyr, Bengal, from cow-urine. It is an impure salt of euxanthic acid. Unstable in linseed oil, more durable in poppy; quite durable in water-color.

Mars Yellow (Mars orange, artificial ochre, jaune de Mars).— Species of artificial ochre produced by precipitating an iron salt (usually green vitriol) with alum by the agency of caustic soda, potash or lime. Permanent if carefully prepared.

Naples Yellow (jaune de Naples, jaune d'antimoine, Neapelgelb, giallo di Napoli).— Under this title are: (1) The English mixture of cadmium yellow or a deep cadmium with a white; (2) the true Naples yellow — a basic lead antimoniate. The first (imitation) is permanent in oil, the latter liable to darken if sulphuretted hydrogen gets at the lead. As a water-color it quickly darkens.

Yellow Lake (brown pink, citrine lake, yellow madder, Italian pink, quercitron lake).— Best is obtained from quercitron bark. Formerly prepared from Persian, Turkish or Avignon berries. None recommended for artists' colors because very fugitive in oil or water-colors.

Chrome Yellow (chrome, chromate of lead, jaune de chrome, Chromgelb)— Should be neutral lead chromate of pure yellow tint. Orange and reddish hues obtained by adding lead oxide. All lead chromates are fugitive more or less but last longer preserved in oil varnish.

Burnt Ochre (American sienna).— Made from raw sienna with high percentage of ferric oxide and is mahogany color. Not favored because muddy.

Vanadium Yellow.— Costly and very fugitive.

King's Yellow (orpiment, jaune royal, Königsgelb).— Yellow arsenic sulphide. Very lovely but fades badly in oil or water-color.

Reds.

Vermilion (cinnabar, vermilion, Zinnober).— Ground mineral mercuric sulphide.

Madder (pink madder, rose madder, madder carmine, madder red, Rubens madder, madder purple, madder lake, madder brown, carmin de Garance, laque de Garance, Krapplack).— Produced from madder plant or artificially from alizarin and purpurin (anthracine derivatives). The madders are not truly permanent.

Mineral Lake (pink color, laque minerale).— A precipitate, caused by the action of neutral potassium chromate solution with a stannic chloride solution, dried and calcined. Strictly permanent.

Light Red (burnt ochre, rouge anglais, brun rouge).— Should be burnt yellow ochre, a permanent pigment.

Venetian Red (rouge, crocus, colcothar, caput mortuum vitrioli).— At first was a native ferric oxide or red hematite less purplish than Indian red, but is now artificial ferric oxide from calcining green vitriol. Less brownish than light red. Permanent.

Indian Red (Persian red, Indian red ochre). — Made from red ochre or red hematite. Has slightly purplish tinge and contains about 95 per cent ferric oxide. Most comes from India, where it is native, but some is calcined. Genuine is permanent.

Red Ochre (red hematite, red iron ore, scarlet ochre, red chalk, ruddle, bole, sinoper, sinopis, rubrica, miltos, terra rosa).— All are native ferric oxide or iron peroxide combines in different proportions of clay, chalk and silica, and range from cherry red, reddish brown, to yellow brown. Italian terra rosa shows pinkish tinge (probably artificial).

Para Vermilion.— A para-nitraniline lake. One marketed shows 90 per cent barytes, 5 per cent zinc oxide and 5 per cent para-red. Soluble in linseed oil.

Indian Lake (lac lake, Lack-lack).— Lac resin secretion of the East Indian lac insect. (see Lac). Less fugitive than crimson lake, more so than madder.

Carmine and Cochineal Lakes (carmin, laque cramoisie, crimson lake, purple lake).— Precipitated coloring matter of the cochineal insect. (See Cochineal). Very fugitive.

Red Lead (minium saturnine, mine rouge, mine orange, mennige, rosso saturno).—Beautiful orange red composed of two molecules protoxide of lead with one molecule binoxide. Quickly discolors in contact with sulphuretted hydrogen. Not practical for water or oil.

Greens.

Terre Verte (green earth, terre de Verone, grüne Erde, terra verte).— The earth minerals glauconite and celadonite. Very permanent in oil or water-color.

Viridian (emerald oxide of chromium, vert pannetier, vert de Guignol, vert emeraude, Mittler's green).— Hydrated sesquioxide of chromium produced by calcining a mixture of boric acid and potassium bichromate. Valued by artists for the purity and transparency of its bluish green; blending with other colors.

Cobalt Green (Rinmann's green, vert de cobalt, vert de zinc, Kobaltgrün).— Produced by combining by heat oxides of zinc and cobalt. A beautiful green, permanent in oil and water-color.

Emerald Green (cupric aceto arsenate, Schweinfurt green, vert Paul Veronese).— More opaque and brighter than Scheele's green, but also very poisonous. Produced from verdigris and white arsenic. Forbidden for household purposes.

Scheele's Green (cupric arsenite, Swedish green, Mittis green).—Arsenite of copper. Too poisonous for use.

Malachite Green (green verditer, green bice, mountain green, green carbonate of copper, vert de montagne, Berggrün).— A ground copper mineral found on most continents, but Russian preferred for its color.

Verdigris (basic copper acetate, vert-de-gris, verdet de Montpellier Grünspan).—An ancient pigment, but has tendency to darken. Is now preserved from alteration by copal varnish or hard paraffin.

Blues.

Ultramarine (lapis lazuli, Lasursteinblau, outremer, bleu d'azur).— Genuine is very costly, being produced by heating selected pieces of lapis lazuli, then immersing in cold water or vinegar; it is then washed, dried and carefully ground and purified. Nearly transparent in water or oil-color and permanent.

Artificial Ultramarine (new blue, French blue, permanent blue, aniline blue, Guimet's blue).—Analyzes same as above natural product, but is produced from kaolin (china clay), silica, sodium sulphate, sodium carbonate, sulphur, charcoal and resin.

Cobalt Blue (cobalt, bleu de Thenard, Kobaltblau).— Three pigments so designated: (1) A combination of alumina and cobalt oxide. (2) Leithner's or Thenard's blue, a cobalt phosphate with aluminum base. (3) Aluminous cobalt arseniate. All permanent except to influence of ammonium sulphide.

Coeruleum (coelin, cerulean blue, bleu celeste, Coelinblau).— Produced by precipitating potassium stannate with cobalt chloride, washing precipitate, mixing with pure silica and heating. Rather greenish blue. Permanent.

Prussian Blue (Turnbull's blue, Antwerp blue, Berlin blue, prussiate of iron, Chinese blue, Saxon blue, bleu de Berlin, Pariserblau). — These include three varieties: (1) Soluble Prussian blue, potassio-ferrio ferrocyanide. Less stable than the others. (2) Insoluble Prussian blue, produced by oxidizing Turnbull's blue with nitric acid, is more permanent than the first. (3) Turnbull's blue, or Gmelin's blue, can be produced by precipitating a ferricyanic acid solution with ferrous sulphate solution. A good color but not as pure as the second, and fades quicker. The common commercial Prussian blue contains proportions of all the above.

Cyanine (Leitch's blue).— A mixture of cobalt blue with Prussian blue.

Indigo.— Derived from the *Indigofero tinctoria*, a leguminous shrub. In the plants the coloring matter is a colorless glucoside which, in combining with water, *splits* up into a sugar and indigo. Not fast to light as oil or water-color, but is more durable preserved in gum copal. Its high cost forces its being substituted by ultramarine or Prussian blue.

Smalt (royal blue, Dumont's blue, zaffre, bleu de smalte).— Combination of cobalt with potassium silicate. The dark glass is fused, subjected to cold water, then ground fine and washed. Moisture and carbonic acid in the air attack it.

Browns.

Raw Umber (Levant umber, terre d'ombre, umbra, Kölnischeerde, terra ombra).— Best comes from Cyprus. Differs from the ochres in having a good proportion of the higher oxides of manganese and less water. The mineral is ground, washed, dried. When heated to acquire a reddish hue it is termed *burnt umber*, the ferric hydrate becoming red ferric oxide.

Burnt Umber. See above.

Raw Sienna (terre de Sienne, Sienaerde, terra di Siena).— Obtained from Tuscany and the Hartz Mountains. A browner variety of yellow ochre with large proportion of ferric hydrate. Used in oil, water and fresco colors. Fades yellower with time.

Burnt Sienna.— Produced by roasting raw sienna, which gives it a warm reddish brown tone, exceptionally translucent. Permanent.

Vandyke Brown.— Three different pigments sell under this name: (1) Calcined brown ochres. (2) A dark variety of colcothar. (3) A brown earth containing much organic (bituminous) matter and oxide of iron with hydrate. The two first are permanent, the last not.

Cappagh Brown (euchrome, mineral brown). —An earth extracted from the Cappagh Mine in Ireland. It is more reddish than raw umber and contains ferric hydrate and ferric oxide with manganese. Produces a good oil color but permanence is doubted.

Bistre (bister, Braunerlack, Russbraun).— Produced from the tarry soots of certain burnt woods, especially beech. Not used in oils. Fades, by oxidization, in light.

Asphaltum (bitumen, mineral pitch, Antwerp brown, mummy, asphalt brown).— Made from the well-known mineral. (See ASPHALT). Those varieties most free from the paraffin hydrocarbons are preferred for pigments. It is ground in oil or turpentine. They have a tendency to injure contiguous pigments and are not used greatly by artists. The Egyptian mummy submitted to heat, then ground (including the bones) is declared to make a better palette color than asphalt alone.

Prussian Brown.— In the commercial product the soluble potash salt has detrimental effects and should not be used as a pigment till it is purified from it.

Sepia.— The dark-brown pigment obtained from the ink-bag of the cuttlefish. It is prepared by solution in soda or ammonia, then strained and precipitated by neutralizing the alkali with hydrochloric acid. It is then washed and dried. It is not light-fast and is not used in oil.

Blacks.

Indian Ink (Chinese ink, Japanese ink, encre de Chine, chinesische Tusche).— This consists mainly of lamp-black, produced from oil or pine-wood, combined with gelatine and scented with musk, camphor, cloves or rosewater. The oil used is sesame, Cannabis sativa or Dryandria cordata. The soot is combined with size made from fish glue and parchment. The paste, made into sticks, is subjected to hammer-blows, and, after being shaped as desired, is very slowly dried. It cannot be used in oil but is a first-class water-color. The good grades are permanent.

Lamp Black (noir de lampe, noir de fumée, noir d'houille, Russ).— Soot created from imperfect combustion of resin, oils or fats, paraffin, coal tar oils, or even coal oil, caused by insufficient air supply. The extreme fineness of the microscopical particles renders it exceedingly smooth. It is a gray black and permanent.

Charcoal Black (blue black, vine black, Frankfort black, noir de vigne).— Charcoal produced from non-resinous woods coarsely ground, washed to release soluble mineral matter. Being hygroscopic, it must be thoroughly dried if ground in oil. That gained from willow, maple and bass have been used successfully as a pigment, but nutshells (cocoanut especially) produce the best. If carefully washed and properly carbonized it is permanent. The German pigment is made chiefly from charred grape-vines.

Ivory Black (noir d'ivoire, Elfenbeinschwartz).— Made from charred ivory waste. Permanent.

Graphite.— The so-called black-lead or plumbago used for pencils and stove polish is also utilized as a pigment, but it is usually mixed with a heavy base, such as silica. It has many defects. Its chief use at present is as a lubricant.

Mineral Black.— Generally a finely ground heavy black slate, but it needs mixing with carbon and lampblack to give it depth. As its grinding quickly ruins the mills it is not favored by paint manufacturers.

Coal.— Both anthracite and bituminous coal finely ground have been used as pigment.

With the above knowledge of the constitution of the various pigments we see they can be classified as *mineral* and *organic*. Of the first we have the native ores such as ochre, terre verte, ultramarine; artificially prepared are aureolin, cobalt blue, viridian, etc. Of *organic* we have (animal) Indian yellow, carmine, sepia, etc.; of vegetable origin we have gamboge, indigo; artificially produced are Prussian blue, etc.

Mixed Paints.— Until quite recent years the market supplied only dry ground pigments or the same ground in oil. And, when the paint manufacturers attempted to produce and sell a “ready-mixed” paint, ready for the painter's brush, to the house painter and decorator they had a hard task before them. The difficulty in manufacture lay in necessarily overcoming the tendency of pigments ground in oil and supplied with the correct amount of *driers* and *vehicle* from “settling” to the bottom of the package, of *separating* according to the different specific gravities of the elements combined, or even of *hardening*. The successful solution of the problem is due to Americans (generally claimed by New Englanders) and is due to the discovery that the conditions are fulfilled practically by intermixing a solution of silicate of soda (“water glass”) with the linseed oil paint.

Zinc oxide next displaced the silicate of soda as it holds up white lead well. To retain the natural moisture, water (not over 4 per cent) is used frequently.

Inert Fillers or Extenders.— Nearly all mixed paints contain proportions of inert matter used to increase their bulk, a condition brought about, largely of necessity. Some pigments in their unmodified form are too heavy for practical use alone, such as white lead. Others are too light or bulky, as lampblack, graphite, etc. Some, again, are too powerful of tone and too expensive to be applied to surfaces without reduction. In the commercial use of prepared paints fillers must, therefore, not be considered as adulterants or substitutes. While they may reduce the prime cost of the paint, they often improve the quality and the practicability. Figuring chiefly among these inert fillers are: Barytes, barium sulphate, barium carbonate, several forms of silica, calcium carbonate, white mineral primer, clays (silicate of alumina), kaolin, asbestine, gypsum, charcoal.

Vehicles.— In order that pigments may be applied to a surface thinning liquids must be added which possess binding qualities so that the pigments may be adhesively retained upon the surfaces to which they are applied. Such liquids are called vehicles or carriers. Nearly all oils are waterproof and will shed water but only a few have the property of solidifying into a hard waterproof surface coat and these latter are called fixed oils.

Flax and poppy are the only plant seeds of importance in the paint industry as producers of fixed oils. Poppy-seed oil is in some respects superior to linseed oil, the fact that the latter is by far the cheaper has made it the well nigh universal oil for use as a pigment vehicle.

Volatile oils are used in painting for rectifying some defects in the fixed oils that are used as binding vehicles in exterior painting and for what is called *flatting* in interior work. Their use enables a painter to put on a heavier coat of pigment with less linseed oil than would be possible with the use of linseed alone since the volatile oils mix intimately with the fixed oils render them more fluid. The principal volatiles in use are spirits of turpentine, or oil of turpentine, naphtha and benzine. A widely used vehicle is *tung* oil, produced from the wood oil tree (*Aleurites Cordata*), made in China. Fish oil obtained from menhaden and refined has been found a good substitute for linseed oil. The tung oils of China and Japan are very good mediums (some declare the best) for waterproof and marine paints. Poppy seed oil is a favored medium for artists' colors. Turpentine is used largely for diluting or dissolving pigments. Benzine (or benzol) is extensively used in the manufacture of ready-mixed paints; acting both as diluent and as liquid dryer; its low cost has no doubt been an incentive.

Driers.— While linseed oil dries by oxidation in the air, it is frequently necessary to accelerate its action by the addition of certain sicoatifs. The desired function of a drier in oil paint is to accelerate the absorption of oxygen to create a film of dry, hard, insoluble substance on the outer surface. There are two classes of driers: resin driers and oil driers. Oil driers are produced by heating linseed oil combined with a salt of oxide of lead and manganese to from 500° to 600° F. This is reduced with benzene or turpentine or both. The “resin” driers, known also as “Japan driers” are composed of metallic salts or bases fused with resin and linseed oil, then reduced with benzene or turpentine. They dry quickly as a varnish. The latter kind of driers has defects not contained in the oil driers.

Paint Statistics.— The census of manufactures for 1914 states the following: With 585 paint manufacturing establishments having a combined capital of $99,673,137, employing 13,349 wage-earners, the product amounted to $112,409,000. Of bone, carbon and lampblack the product amounted to $1,464,000, $535,000 and $929,000, respectively. Mineral pigments of the United States marketed in 1913 were valued at as follows: Ochre, $173,944; umber and sienna, $20,000; metallic paint, $171,264; basic lead carbonate, $18,112,219; red lead, $2,127,976; litharge, $2,524,707; orange mineral, $71,625; lithopone, $2,170,445; Venetian red, $116,195.

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PAINT, Luminous, a phosphorescent substance used as a coating for surfaces. The phenomenon of phosphorescence, which gives to luminous paint its distinctive character, has nothing to do with phosphorus, whose luminosity is due to slow oxidation. The first discovery of a substance emitting light without oxidation belongs to the early part of the 17th century, when sulphide of barium (Bologna stone) and chloride of calcium (Homberg's phosphorus) were discovered. Sulphide of calcium dates from 1768; sulphide of strontium is the latest discovery in this kind. Any of these substances, if enclosed in a sealed glass tube and exposed to sunlight, and then carried into a dark room, appears at first brilliantly luminous and long afterward like a hot body cooling. Practical application has been made of the property in the production of luminous paint, the above compounds being ground and mixed with a vehicle, as in ordinary paint and laid on the surface that is to be made luminous. A modern improvement of this method is the admixture of a small amount of radioactive matter, which makes the paint independent of exposure to daylight. Luminous paint is used chiefly for the dials of watches or compasses for use at night.

PAINTED DESERT. This name is applied to the wide area of plateaus and low mesas extending along the east side of the valley of the Little Colorado in northern central Arizona. To the north it extends along the top of the east wall of Marble Canyon of the Colorado River; to the south it ends near the Santa Fé Railroad which crosses it from Holbrook to Winslow. Along the east side rise the Echo Cliffs to the north and farther south the high plateaus and buttes of the Hopi Indian pueblos. Thus defined its length is about 100 miles and width 15 to 20 miles. Most of it lies at an altitude of nearly 5,000 feet. The climate is arid with annual rainfall averaging about six inches and consequently the vegetation is scant. Vast areas of the rocks are bare or nearly so. These rocks which are upper Permian and Triassic in age lie nearly level in a succession of low steps rising to the east. They present a great variety of colors, red, pink, chocolate, purple, lavender, pale green and gray, which suggested the name Painted Desert applied by Ives and Newberry in 1858. Consult Gregor, H. E., The Navajo County, U. S. Geol. Survey, Water Supply Paper 380, and Professional Paper 93; Darton, N. H., Reconnaissance of Western New Mexico and part of Arizona, U. S. Geol. Survey, Bull. 365, Darton, N. H., Guide Book of Santa Fé Railroad, U. S. Geol. Survey Bull. 613; James, G. W., 'Indians of Painted Desert Region' (Boston 1903).

PAINTED QUAIL. See QUAIL.

PAINTED TERRAPIN or TORTOISE. See TURTLE.

PAINTING, in the fullest meaning of the word, signifies the application of color to any surface, for the purpose of making it more attractive to the eye, or as a preservative of the substance painted, but in this article the word is restricted to the art of painting, that is, the art of representing objects, real or imaginary, on a flat or nearly flat surface by the use of designs in line and color. Leaving out of account the designs of bison and reindeer made by prehistoric man in the caves of Europe, the origin of this art, like that of several others known to civilization, is lost in the mists of those prehistoric ages on the banks of the Nile which the researches of modern Egyptologists have pushed back, apparently, to the distance of 80 centuries. Some few traces of it among the unknown autochthonous races who preceded the long lines of the dynasties of Upper and Lower Egypt have been but recently assigned to their proper sources; the art of the dynasties of the Pharaohs and the Ptolemies, notwithstanding their duration by centuries, presents certain striking characteristics which distinguish it from all others. It was strictly a conventional and symbolic art, largely an official art, devoted to the service of the monarch and of religion and within these limits, a decorative art. Sculpture was subservient to architecture and painting — except on the walls of the tombs and in the papyri — to sculpture. Our knowledge of painting is derived from the very numerous examples preserved on the walls of the temples and the tombs, on the mummy cases and the sarcophagi, on the funeral tablets and the illuminations and vignettes on papyrus and linen. The conventions in which the art remained bound — with but few exceptions — were established in the earliest ages; they embraced all design, religious and secular, requiring that human figures and those of animals should be represented in profile, defined by an outline and in flat color; for landscape and architecture there was adopted a curious and ingenious combination of drawing, both in ground plan and in elevation, to express the scene in the simplest and clearest manner possible. The background was left blank, or filled with a flat tint; the required lucidity and directness of expression forbade the use of linear or aërial perspective, or any attempt at modeling or variation of the conventional local color. On the inner and outer walls of the temples the outlines were incised, sometimes very deeply,— the figure within these outlines frequently rounded down to the bottom of this incised outline; on the walls of the tombs the painter replaced this outline with one made by his brush. He worked directly on a coat of white stucco, applied over a rough-cast to conceal the joints and the roughness of the masonry wall; of colors — derived mostly from mineral sources — he had, at the most flourishing period of the art, as many as 18 or 20, as we know from wooden palettes of the 18th dynasty, which have been found. These colors were mixed with water and gum tragacanth, possibly with honey; some mummy cases of the later dynasties have been painted in encaustic and in some cases the eyes and eyebrows of the mummy masks are in enamel. These colors have retained their brilliancy to a remarkable degree through the ages; very few of the paintings are cracked. The artist worked with brushes of reeds or rushes, the ends of which were soaked in water until their fibres separated and they were adapted to the finest and most delicate work. In the papyri — as in the many hundred copies of the Book of the Dead extant — the illustrations stretch along the top of the page, like headpieces, or are inserted as vignettes, or initials, or full-page pictures. In many cases they are merely outline sketches in black or red. In general, figures of men are colored a dull red and those of women a light yellow, the gods and the genii of the dead may be of positive greens and blues and the animals are frequently spotted. The colors are always pleasing and harmonious and on the largest wall spaces a comprehensive and well sustained color-scheme is frequently found, designed and carried out with true artistic skill. On the outer walls, exposed to full sunlight and in the deepest recesses of the tombs, the colors are most vivid; in the intermediate chambers of the tombs they are more quiet and discreet, to suit the tempered light. See EGYPT.

Greek and Roman Painting.— In the middle of the 6th century before Christ, Greek painting was technically no farther advanced than that of Egypt or Assyria. Greek writers speak with the same enthusiasm of the works of their great painters as of those of their sculptors, but it is only by these descriptions and by some supposed copies and adaptations in the work of the craftsmen, mural painters and mosaicists, of the decline of the art under the Roman domination, that we can form some definite conception of these masterpieces. It is noticeable that the rhetoricians are especially impressed by the ability of the painters to represent objects so naturally as to mystify the spectator. The development of the art through its various phases can be fairly well traced in the wall paintings discovered in Etruscan tombs; it practically embraced all subjects, mythology, history, scenes from daily life, landscape, marines, portraits, animals, tragic and satirical representations, still-life, ornament and decoration and miniatures. Composition, order, linear and aërial perspective, chiaroscuro, a knowledge of the human figure extending to foreshortening, action, expression by gesture and by countenance, all were included. The color work was even extended to the tinting or painting of statues (though there seems to be no proof that the Greeks colored the nude parts of their marble statues) and to the moldings, triglyphs and other ornaments of their architecture. Praxiteles (q.v.) when asked which of his works in marble he valued the most, replied: «Those on which Nikias (the painter) has set his mark.»

In Pompeii, the painted portions of the temples are always finished in stucco or plaster. Portrait painting was apparently more in favor among the Romans than among the Greeks. The long series of painted vases — from the earliest examples of the «Pelasgic» or pre-Homeric period down to the disappearance of the art about 65 B.C.— was but one of the features of this comprehensive school of painting. The only examples of easel pictures which have been preserved are a few small paintings on marble and slate, found in Herculaneum and in Etruscan tombs.

Apelles introduced the use of a glaze or varnish over the completed tempera painting. In the latter, the colors were tempered with a glue, a gum, honey, white of an egg, juice of the fig, milk, or other glutinous substance, soluble in water, that served to bind them; or with wax or some resin, when these materials had been rendered by any means vehicles that could be worked in water. In tempera painting colors were applied to the dry wall; in fresco (See FRESCO), to the wall while the plaster was still wet. Both methods are found in Pompeii; the backgrounds always in fresco and generally, the architectural framing and ornaments; the small figure panels in the centre are generally painted in tempera on the fresco background. In fresco, no colors except earths were used, and these were protected by an encaustic varnish, which also served to give them more brilliancy. Encaustic painting was used only for pictures on tablets or on canvas; in this process naphtha, or spirits of turpentine, or any volatile, ethereal oil that will evaporate, leaving the wax colors firmly fixed, can be used as menstrua to liquefy the wax. In the usual method, when the colored sticks of wax and resin have been melted over a fire the colors are applied broadly with a brush and then blended by means of a metallic instrument, a spatula or cestrum (generic name *cauterium*), at times used very hot. The same instrument is used to finish the painting by taking, while still hot, cold wax colors and blending and grading them on the first painting. The colored sticks of wax and resin, softened by the addition of an oil, may be applied from a hot palette with a brush and then melted and modeled with the cestrum. The same sticks, softened by the addition of an oil, may be used directly, like crayons of pastel; or, when dissolved in an essential or volatile oil, applied with a brush; but these two methods, not involving the use of heat, are not, strictly speaking, encaustic painting. In all cases, the ancients prepared their walls very carefully before painting, the final surface receiving a firmness and consistency almost equal to that of marble. Their colors were almost exclusively mineral, the only animal substance known being the slimy matter of the *Murex* (q.v.), mixed with chalk. This purple is unknown to the modern palette.

Byzantine and Early Mediæval.— The influence of ancient art on that of the early Christians was long in disappearing — notwithstanding the widely divergent tendencies of the new religion. Inheriting the Jewish aversion to idolatry and to works of material imagery, the Fathers of the Church declaimed against all artists — Tertullian denounced them as persons of iniquitous occupations. The paintings and decorations in the Roman catacombs — rediscovered at the end of the 16th century — especially those in the earliest cemeteries, bear a great resemblance to the ancient wall paintings. Orpheus playing on his pipes reappears as the youthful and beardless Christ surrounded by his sheep, and Hermes Kriophoros, carrying a ram on his shoulders, as the Good Shepherd. The bearded type of the Saviour, with which we are familiar, was not generally adopted till later, in the earliest mosaics. As the Church increased in numbers and power the primitive prejudices disappeared, but early Christian painting shared in the general decline of all the contemporary art of the empire. Occasional efforts were made by the emperors to check this decadence, by Constantine and by Valentinian, Valens and Gratian in the 4th century; and in the 5th by Theodoric at Ravenna, the capital of the Ostrogothic kingdom in Italy. The first mention of church painting is found in a canon of the council held at Illiberio (Granada), Spain, about 305 A.D.; but the mediæval wall paintings have nearly all disappeared — very largely by conflagrations. Our insufficient knowledge of the early mediæval painting is principally derived from the mosaics, the most important being at Ravenna and Rome, and from the miniatures and the illuminated manuscripts. In Byzantium, the mosaic wall decorations were not confined to the churches but were also employed to celebrate the deeds and the power of the monarchy, as in the Chalkê, the great state hall of Justinian's palace. With the establishment of the Lombards in Italy, the ideals, the freedom and spirituality of both the Church and its art, fell into even stricter bondage. The subject of the Crucifixion first appears in painting in the latter part of the 6th century, the figure of the Saviour frequently clad in a long purple robe and sometimes wearing a regal crown. The classical period of early Christian art came to a close with the outbreak of the Iconoclastic schism, in the beginning of the 8th century.

The mediæval style was formed by the gradual union of these classic traditions with the hereditary art of the Western barbarians conquered by the empire or who overran it. Each of these races contributed an individual note — the Irish monks excelled in illuminating manuscripts, their art being continued by the Anglo-Saxons; under Charlemagne mural painting, both sacred and profane, was greatly in favor, though nothing now remains save miniatures; but these primitive impulses did not extend south of the Alps until the Romanesque period, ending in the 13th century. The first indications of Gothic art appear in the miniatures toward the close of this period — in the angular and broken folds of the draperies, indicating that tendency which was to «govern the human sense of form in all its modes of expression, down to handwriting.»

Later Mediæval-Gothic.— It was in France that the so-called Gothic architecture took its origin; and there, too, that the other arts took the lead in Europe, in the middle of the 12th century. Painting gradually escaped from the domination of the priestly order; the painters became specialists, working exclusively at mural paintings, particularly so in the northern countries. Hence, a certain growth of individuality of conception, a tendency toward subtlety and mysticism, an attempt at realism, including study from nature — the whole, as yet, much hampered by tradition. After the middle of the 14th century there appeared very definite signs of an appreciation of the full capacities of the art of painting and serious attempts to realize them. In this art, including miniature painting in books, France took the lead, as she had done in architecture. The development of Gothic architecture, as it diminished the spaces for wall paintings, greatly increased that of the windows, and thus gave a great impetus to the noble art of glass painting. In the 14th century, distinct schools of painting begin to appear, as, in Germany, those of Prague, of Cologne, of Westphalia, etc., and even the names of individual artists become known; the panel paintings of the French and the Flemings bear a general resemblance to those of the Lower Rhine; but in Italy the art, both in conceptions and in technical methods, followed distinct national lines — preparing the way for the Renaissance. Foremost among these precursors were the Tuscans, Niccola Pisano (q.v.), the sculptor, and Giovanni Cimabue (q.v.), the painter. The first great epoch in modern painting is considered to have been that signalized by the mature works of Giotto di Bondone (q.v.) (1276–1336), a pupil of Cimabue, who was acclaimed by his contemporaries as the greatest genius in the arts of Italy. To their astonished eyes, Giotto's power of presenting objects naturally was so great that «the thing itself» was reproduced. With this he combined a great command of the arrangement and execution of monumental mural painting and a freedom from the traditions both of the Byzantine manner and the Northern Gothic, while reproducing in his works many of the decorative ideas of the ancients. Chief among his followers was Andrea di Cione, called L'Arcagnuolo, or, in the contracted form, Orcagna. The painters of the school of Sienna ranked almost in importance with those of Florence; and in the Campo Santo of Pisa are still preserved some of the greatest monuments of fresco paintings, executed by various artists of this closing period of the Middle Ages.

China and Japan.—The technique of the art of painting in China and Japan is founded primarily on the caligraphic dexterity which was the chief ideal of the older Chinese painters and their Japanese followers, and which is still held in high honor. The ancient art of handwriting was based upon a system of representing or symbolizing the thing indicated, and both it and the art of painting were fettered by traditions that were as binding as those of Egyptian art. Linear design has remained the important element even in painting, the outline being always retained. As an art primarily decorative and suggestive, and not realistic, its fundamental principles differ widely from those of all the European schools. The Japanese themselves compare their art of painting — which they consider the richest and most important, the most intimate expression of the national character — to «sketching.» (*La peinture japonaise a la caractère d'une esquisse,* says the official work published by the Japanese Imperial Commission at the Exposition Universelle of Paris, 1900). As a *sketch*, or, rather, as a work in which only the essentials are retained — appealing to more artistic and more intelligent taste than the finished realistic picture — these paintings dispense with careful definition, with chiaroscuro and perspective, qualities neglected by both the Chinese and Japanese masters in their search for idealistic design and decorative feeling. The care bestowed upon the line leads to a very skilful characterization and suggestiveness in design — marred by the limitations and conventions of both national arts; the generally tempered and restricted color scheme permits of the most subtle and beautiful tones and of a very artistic rendering of aërial perspective in the landscapes, especially in the Japanese. The painter does not hesitate to leave his canvas or his paper untouched in spots so as to concentrate on the principal motif; he is in search of an abstract beauty, not of that of the individual — in accord with the Buddhist principle of the social development rather than of that of the individual. This is peculiarly true of the Butsu-yé, or picture of the true Buddhist school, which is distinguished from the works of the secular artists by certain distinctive qualities. In China, notwithstanding the number of epochs which the art of painting has traversed and the varying influences to which it has been subjected, it has retained throughout a general unity of principles. The Japanese claim that in deriving their art from the Koreans, the Chinese and the Hindus, they had bettered their instructions and given their own style to the art — a greater charm and subtlety of line, a greater delicacy and beauty of tone in the color. Both nations refer the origin of their art to a legendary era, the Japanese claiming 13 centuries of duration and the Chinese historians ascribing the invention of painting to Che-hoang, minister of the Emperor Hoang-ti, in the 27th century before Christ, contemporary with the introduction of writing by Tsang-hie — these two personages considered by some authorities to have been identical. No satisfactory record of an individual painter, however, appears before the 3d century A.D., nearly 200 years after the introduction of Buddhist pictures and images from India. According to an ancient Japanese writing, the history of pictorial art began in that country in the reign of the Emperor Yuriaku (457–479 A.D.), introduced by a Chinese painter of royal descent, Nanriu or Shinki. It is probable that Japanese art took its real birth at the period of the introduction of Buddhism in the middle of the 6th century.

Persia and India.— It was from China that Persia originally derived the arts of architecture, painting and ceramics; for the second of these, the general principles and the technical methods, even to the vellum upon which the paintings were executed, were Chinese. Later, many of the elements of the art were adopted from that of the Arabian Caliphate, an art which had been born in Egypt and developed in Syria. Under the dynasties of the successors of Genghis Khan (1199–1335 A.D.) painting in Persia assumed definite forms and characteristics; indeed it is asserted to have been borrowed from Turanian, Dravidian, Greek, Sassanian, Mongol and European sources. During the Mohammedan domination its influence was extended to India, where it succeeded the native traditions. The art of the two countries under the Mongol emperors was practically the same; in both the ancient mural paintings having almost completely disappeared, it is preserved only in the miniatures. Modern Hindu painting and sculpture are both in lamentable decadence; the former, never having even undertaken to represent nature, is content with traditional and decorative formulas.

For painting of Europe after the close of the Mediæval epoch, see RENAISSANCE PAINTING; POST-RENAISSANCE PAINTING.

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PAINTING, Education in. The education of the painter is to-day altogether different from what it was in the Middle Ages and the Renaissance, and this difference is largely dependent upon a different conception of the social status of the artist. In the mediæval world the painter was a craftsman, like the carpenter or the smith. Often, indeed, he had been trained as a goldsmith before he became a painter. The individual artist might rise to some eminence and consideration, but as an artist he was a member of a mechanical trade which no one would have thought of putting on a level with the learned professions. To-day the painter, the sculptor, the architect, is a professional man, like the lawyer or the physician, and his education is planned, as nearly as possible, on the lines of theirs. As long as the artist was considered a tradesman he was educated like a tradesman; that is, by apprenticeship to a master of the craft. In a modified form this apprenticeship system was in force as late as the 18th century, but its character can best be understood by considering it as it was practised in the 15th.

In the 15th century, then, the master painter kept a shop, a bottega, which differed in no essential particular from the shop of any other tradesman, and his business was to supply anything that was wanted in the way of painting, from the ornamentation of a chest or the painting of a sign to the production of an altarpiece or the frescoing of a palace wall. He maintained a force of journeymen and apprentices, and it was no more expected that he should produce with his own hands everything which left his shop than it was expected that the master joiner should plane every board or the master mason lay every stone. To such a master a boy who showed any disposition toward art was bound out, at the age of 12 or 13, for a term of years. He was to give his services in any capacity in which they were available and a sum of money was paid the master, who, in return for this premium and service, engaged himself to teach the boy his trade. The apprentices swept out the shop, ran errands, waited on customers, ground colors, prepared canvases and panels, pricked cartoons and pounced them upon the wall, set the palette and cleaned the brushes of the master. At odd times they copied the master's studies, and always they watched his methods and learned how he did things and by what succession of processes a picture was produced. At the end of his term of apprenticeship the boy had learned enough to be useful and was worth a wage. He became a journeyman and was free to stay with his master or to engage himself to another. At this stage of his evolution he was intrusted with more important work, designed borders and gilded halos, painted backgrounds or draperies from the master's studies, made studies himself for the less important parts of pictures, finally painted entire pictures himself under the master's supervision and on the master's account — pictures which were almost indistinguishable from the master's own and were frequently signed by him before delivery to the customer who had ordered them.

If the young painter were unambitious he might remain at this stage all his life. If he were determined to be a master in his turn he probably traveled a little and engaged himself to this or that more celebrated master that he might study other methods than those he had learned, pick up other traditions and familiarize himself with the best work that was being done in his art. When he could do what his masters did as well as they did it, and hardly until then, he was ready to observe nature for himself, to allow his own temperament to influence his work, to become, perhaps, a creator and an innovator, and to teach others all that he had been taught and all that he had learned for himself, so that they might begin, as nearly as possible, where he left off.

The typical education of a modern painter is as different from this as possible. He begins his special education later than did the mediæval painter, having spent some years in ordinary schooling, perhaps even in securing a college training. He may have done a little desultory drawing during this time, but about the age of 20 or later he decides to become a painter and begins his serious education in art. He begins it not as an apprentice, but as a student; not in a shop, but in a school. If the school is a great state institution or one connected with a university, it will afford lectures on the theory and history of art, to which, likely enough, he will pay little attention. It will be in a great city, where he will be able to visit museums which have gathered together the art of many ages and many countries, and to see exhibitions where almost as many methods of work are exemplified as there are individual exhibitors. Even in default of museums and exhibitions he will infallibly have access to many cheap publications which, by some of the applications of photography, will give him a fair idea of the results, attained by the art of the past and the present; of its methods he will know nothing. Meanwhile he will be set down before a plaster cast or a living model and bidden to draw. He will be more or less thoroughly grounded in anatomy and perspective and other sciences, above all in the science of aspects, but he will have practically no instruction whatever in his craft. His canvases and colors, like his brushes, he will buy ready made. His master he will see twice a week, for a few minutes, and that master's criticisms will be directed exclusively to the justness of his observation and the truth of his rendering of nature. The master's own work will be carried on in another place, in quiet and in solitude, and the student will know nothing of it except, now and then, to see the completed picture. The more intelligent and conscientious the master the less likely he will be to attempt real technical instruction, for he will feel that his own methods are tentative, suited to himself alone, and of doubtful validity or permanence, while he will be hampered by our modern respect for individuality and the fear of destroying something more precious than anything he can supply.

After three to five years' work on this system our student will be able to draw with fair accuracy anything set before him, to distinguish its values, even to copy its color with some approximation to success. On the other hand he will have exercised little either his invention or his memory, will know nothing of ornament and little of design, and will be entirely in the dark as to what he wishes to do with his acquired science, while he will have had no practical experience of the thousand and one processes that go to the production of a picture. Likely enough he will never have made a tracing or squared up a sketch; almost certainly he will never have arranged a drapery; quite certainly he will, no more than his master, know anything of the proper management of oil colors, of the use of vehicles or of the composition and permanence of pigments. For a time he will try to do outside the school what he has always done in it, and will be surprised that no one cares for the result. Then it will perhaps dawn upon him that he has learned a science but not an art, he will flounder and experiment, and, if he is a man of force and originality, he will invent an art of his own and methods that will somehow serve his needs. If he is of a cool and logical mind he will recognize that his training was vastly better than none and will, in default of a better, recommend it to others or help to give it to them. If he is of a warm and emotional temper he will condemn it as useless or worse and tell those who consult him to get along without it.

It is obvious that the results of these two educations must differ as greatly as the conditions which produced them. The modern painter may readily be a man of broader culture and wider outlook than the painter of the Renaissance; with anything like the same original force he will probably be a more personal and individual artist; he will certainly know a great deal about the aspects of nature that the Renaissance painter never dreamed of. Just as surely he will be the inferior of the Renaissance painter, both as designer and as craftsman, will rarely attain complete mastery of his tools and will try to substitute the charm of his personal sentiment and his individual view of nature for that assured rightness which comes of an accepted body of traditions and the possession of tried methods. What modern art has gained in variety and in the perception of new truths it has lost in weight and coherence. Each artist works in his own way for the attainment of self-expression and does little toward the building up of a great school.

It is easier to see the weakness of modern education in painting than to devise a remedy, and those who are most opposed to the modern academic system seldom suggest anything to take its place. There are many reasons why the old apprenticeship system could hardly be revived. There are such multitudes of students to-day that it would be impossible to find masters for them, and our masters have, in general, nothing for apprentices to do. They are no longer at the head of great workshops, turning out a multiplicity of diverse products. Each is engaged in a more or less narrow specialty, producing work which is valuable only as it possesses his personal quality and exhibits his personal touch, and his patrons would resent the intrusion of any hand but his own as little less than commercial dishonesty. The modern student also knows too much of the art of all times and countries to choose a single master and docilely follow his teaching. It is doubtful if modern conditions have not rendered forever impossible anything like a local school of painting.

The conditions of mural painting do, indeed, entail something like the old apprenticeship system, and in the growing demand for the decoration of public and private buildings there is a hope for the revival of older methods of education. It is recognized that a decorative painter may properly have a corps of assistants, and while these assistants are not likely to be mere beginners, but will already have had an academic training, they are enabled to supplement it with the practical instruction of a master in the methods of creating a work of art.

How far a similar instruction can be engrafted on our academic system is the problem that should most seriously occupy the directors of our schools of art. The rigid discipline in drawing and painting from nature need not be relaxed — in its way it is admirable and should be strengthened rather than weakened — but it should be pointed out that the ability to imitate form and color is a tool, not an end, and that the creation of a work of art is something different from the production of a life-study.

To this end the student should be thoroughly grounded in ornament, both as a training of taste and an exercise in design, and the study of nature should be, as far as possible, subordinated to artistic creation, the structure and appearance of things being learned as they are required for expression. In this way they would be learned both more permanently and more easily. The student's memory and imagination would be educated as well as his eye and his hand, and in the creation of an actual work of art, under the guidance of his master, if that work of art were no more than a painted border or bit of scrollwork, the importance of sound technical methods would be readily appreciated. Such students as had any real talent for painting would be vastly better trained than most of our painters now are, while the others would have a chance to become competent workmen in some of the minor decorative arts instead of adding to the world's too great stock of bad pictures.

And while it must be insisted upon that the education of eye and hand can hardly begin too early, if technical mastery is to be attained, and that we must be willing to sacrifice something of the education of a gentleman to the education of a painter, it would be well if some tincture of mathematics, of history and of letters could be given to take the place of that college training which must of necessity be foregone. See also ARCHITECTURE, EDUCATION IN; SCULPTURE, EDUCATION IN.

KENYON COX.

PAINTING, Technique of. Painting as one of the fine arts may be defined as the application of color on a surface for decorative purpose; or the representation of natural or imagined objects bv means of colors applied on a surface in such a manner as to produce an illusion of reality in form, light and shade and color. It is to the last form of painting, known as pictorial representation, that we shall chiefly devote our attention in this article.

Painting may be divided into (1) monochromatic painting, including drawing in pencil, charcoal, ink and crayon, etc. (see ART DRAWING), in which class, pictures of objects are rendered in various shades of one color; and (2) polychromatic painting in which the artist seeks to express not only the form, light and shade, but also the full charm of color displayed by objects. According to the subject represented, painting may be grouped as follows: (1) historical, including religious and mythological works; (2) portraiture; (3) genre — the representation of domestic life; (4) animal; (5) still-life — pictures of fruit, flowers, pottery and other inanimate obiects; (6) landscape and seascape.

To be able to express himself fully in his work, the painter must know anatomy in figure and animal painting; aërial and linear perspective in landscape and marine painting; and the principles of pictorial composition (see ART DRAWING) in all the forms of pictorial representation. He must also have a good working knowledge of the theory of color, the chemistry of paints, oils and varnishes, and the special technique of the particular form of painting he is pursuing. The subject of painting, therefore, will be treated here in two sections. In the first part, the technique of painting of which there are several kinds will be described; in the second, the history of the origin and development of the various schools of painting in general will be told.

The technique of painting refers to the artist's manipulation of his purely material equipment in his effort to reveal to his fellow beings his impressions of the varied beauties of nature in form, color and perspective. It includes the preparation of the foundation, or ground upon which the painting is executed, and the proper use of the pigments, vehicles and preservative agents. To render the coloring substance applicable, it is mixed with many different kinds of binding materials or media, giving rise to as many different processes of painting, viz., encaustic, tempera, fresco-buono, fresco-secco, spirit fresco, stereochromy, oil, pastel and water-color. The particular technique of each will now be described.

Encaustic Painting.— Encaustic (Gk. ἐγκαυστικός, *enkaustikos*, burnt in) is a process of painting used by the ancients and revived in modern times in which the colors are mixed with wax and resin and liquefied by heat. It was peculiarly an ancient Greek method of pictorial expression, as in Greece the process reached its highest development. Several mummy masks have been found that prove the knowledge of encaustic painting by the Egyptians, but it was not adopted by them till after the Macedonian conquest. The Greeks used it not only in flat tints to cover plain surfaces or sculptured ornament, but also to model the subtle human form. The British Museum, the Louvre, and the Metropolitan Museum of Art, New York, possess good examples of Greek encaustic portraits (chiefly from Fayum, Egypt) together with the cestra, braziers and other implements used in the process. Many of the mural paintings in Pompeii were also executed in this medium. In modern times the secret of the process was largely lost despite the many attempts of the savants to solve the riddle, until 1884 when MM. Cros and Henry published in Paris their now famous monograph entitled 'L'Encaustique et les autres procédés de la peinture chez les anciens, historique et technique,' in which they fully restore the encaustic process. They describe four varieties, based upon a thorough study of existing examples of and writings on encaustic painting. These are as follows:

(1) Colored sticks of wax and resin are melted over a heater either in separate cups or on a metallic palette with depressions for the colors. The tones are then applied hot on the surface to be painted, with a brush and blended with a hot cestrum. To give gradations to the modeling, the intermediate tones are applied with a hot cestrum from the cold wax colors on the cooled palette.

(2) Similar to the first process but with the addition of an oil to facilitate the work.

(3) Cold applications of the preceding mixture conveyed to the surface to be painted, and modeled with cold cestra.

(4) Cold brush-painting with colors of wax and resin dissolved in an essential and volatile oil such as spirits of turpentine. Strictly speaking, the last two processes are not encaustic, because there is no "burning in."

In the last century many mural paintings have been produced in a wax medium that represents but a variation of the fourth process described above. Pictures in this manner were executed by Hippolyte Flandrin in Saint Vincent de Paul and Saint Germain des Prés in Paris; by Andreas Müller in the National Gallery, Berlin; and by Fernbach in the Hohenstaufer Hall of the Royal Palace in Munich. Wax painting for mural decoration is popular with our contemporary mural painters because of its several advantages. These are: (1) its durability; (2) its matt surface and atmospheric tones; (3) its impasto, equaling that of oils, and (4) its quick-drying qualities.

The authorities on the subject are Cros and Henry 'L'Encaustique et les autres procédés de la peinture ches les anciens' (Paris 1884); Richter, O., Donner von, 'Über Technisches in der Malerei der Alten' (Munich. 1885); Crowninshield, 'Mural Painting' (Boston 1887); Laurie, 'Greek and Roman Methods of Painting' (Cambridge 1910).

Tempera.— The Italian word *tempera* originally meant any fluid vehicle with which coloring matter may be mixed, including oil. At present it is applied in a restricted sense to a form of opaque water-color process in which the binding substance is one of the following: (1) yolk of egg; (2) yolk and white of egg beaten together and diluted with the juice from young shoots of the fig-tree or with vinegar; (3) size, in which there is no egg but a thin glue, as gums arabic and tragacanth, glycerin, honey, milk or pieces of parchment boiled down. The size tempera is considered the best as the coloring matter in yolk of egg tends to make yellows deeper, turns red into orange and blue into green. The solvent for all is water. The brushes used are of sable or camel's hair; and any dry surface as paper, canvas, panel or plaster is favorable.

Tempera paintings are characterized by sharp and clear definition (the rapid drying of the color does not permit any blending); flat. brilliant and atmospheric tones; and matt surface. Their main weakness is that they are very perishable. As the colors are soluble in water they are ruined by contact with moisture either on the surface or from behind. Besides, the paint is liable to peel if applied in more than one coat, or when too much egg or size has been used, and is easily defaced by friction. In fact, to preserve pictures in this medium, it is necessary to coat them with an oil varnish.

A thorough study of the paintings of the ancients — the mummy cases and papyrus scrolls of Egypt, the wall paintings of Babylon, Assyria and India, and the panel and wall decorations of ancient Greece and Italy — reveals the fact that the tempera process was used extensively by them from time immemorial. In Mediterranean Europe it prevailed until the 14th century when it gradually gave way to the growing popularity of fresco. In the north of Europe it was much in vogue for panel pictures until about the year 1400 when the superior oil medium was perfected by Hubert and Jan Van Eyck. At the end of the 15th century tempera completely ceased to be used in all countries. In modern times efforts were made in England, France and Germany to revive it but so far with little success. At present it is mostly used for painting theatrical scenery. Among the existing examples of tempera painting by Renaissance masters may be mentioned the famous 'Portrait of Isotta da Rimini' by Pietro della Francesca in the National Art Gallery in London; the 'Portrait of an Old Man with Red Cap' by Albert Dürer in the Louvre, and the 'Three Graces' from Botticelli's 'Allegory of Spring' at Florence.

Consult Pereira, 'Leitfaden für de Temperamalerei' (Stuttgart 1893); Cennino Cennini, 'Trattato' (Eng. trans. by Mrs. Herringham, London 1899); Friedlein, 'Tempera und Temperatechnik' (Munich 1906).

Fresco Painting.— Fresco is a form of mural painting executed upon wet or fresh plaster. The term is derived from the Italian *al fresco* which means fresh. It is often indiscriminately applied to all kinds of mural painting from tempera to encaustic. This is improper and unnecessary. In true fresco the colors are not mixed with wax as in encaustic nor with any kind of glue, size or yolk of egg as in tempera; but either with pure water or with water and lime, and applied on the wall while the plaster is still wet.

The technique of *buon-fresco,* as true fresco is sometimes called, to distinguish it from the false is as follows: The wall to receive the fresco is usually of well-dried and uniformly hard brick. A double wall with an air space is the best. To prepare the wall it is necessary to cover it with two kinds of plasterings — the *arriccio* or rough cast, and the *intonaco* or finishing coat. The *arriccio* which is composed of two parts of sand to one of lime is usually less than half an inch thick and is applied in two or three successive coats. Its surface is roughened the better to hold the finishing coat, and is left to dry for a very long time. When thoroughly dry, it is ready to receive the *intonaco* on which the fresco is painted. After saturating the *arriccio* with water, the *intonaco,* which is composed of well-prepared lime and fine sand, is spread in two thin coats, the whole being about one-tenth of an inch thick. A trowel or wooden float is the tool used for spreading the plaster. The *intonaco* is not laid all at once but in parts, according to the space which the artist expects to be able to cover in a single day. When the picture is so small that it can be completed in a day, the outline is transferred directly from a well-prepared cartoon to the *intonaco.* If, however, the picture is large, requiring several days or more in its execution, the cartoon is transferred to the *arriccio* before any of the *intonaco* is laid. The artist indicates the portion he can paint in a day and the mason who is specially trained for the work prepares it with the *intonaco.* When the day's work is done, any of the plaster that has not been painted upon is removed and is beveled at the edges of the finished work. On the following day the mason joins closely another patch of plaster to the edge of the portion painted upon the previous day, and so on.

The cartoon is usually a carefully prepared outline drawing of the subject of the same size as the fresco is to be and is transferred to the wall by *pouncing.* The method of pouncing is as follows: The outlines of the cartoon are pricked with a large pin of wood or bone. Some powdered charcoal is then spread on a piece of soft muslin which is tied up like a bag. The cartoon is attached to the wall and the bag is briskly rubbed over it. On removing the cartoon, an impression of the subject will be found on the wall.

The brushes used in fresco are long and supple and of bristle, marten, sable or otter. The palette is generally made of tin with a rim around it to prevent the colors from running off. It has a cup in the centre for pure water which is the vehicle for fresco. The colors employed are for the most part the earthen kind and several of the mineral. Those derived from animal or vegetable sources must not be used as they cannot stand the action of lime. A good palette for this work includes the following pigments: lime white (bianco San Giovanni); yellow ochre and Naples yellow; light red, Venetian red and burnt sienna; terre verte and oxide of chromium; raw and burnt umber; cobalt and ultramarine blue; burnt vitriol (purple); and earth black. A specially prepared vermilion is also used.

Of all the forms of painting *buon-fresco* is the most trying to the artist. He must work rapidly and bit by bit; consequently he cannot see the effects of the colors upon each other. Besides when dry the colors appear lighter and warmer than when first applied to the gray plaster. To cope successfully with all these difficulties, the artist must have long practice and consummate technical skill. The special qualities of fresco are: (1) durability, as the plaster in drying, forms a thin layer of carbonate of lime over the painting, protecting it against moisture and moderate friction: (2) a matt surface, enabling the picture to be seen equally well from all points of view; and (3) clearness, brilliancy and luminosity of color.

We are not certain in what country the fresco process was first used; but it is an established fact that it was known to the ancient Greeks as evidenced by the fragments of painted plaster recently discovered by Schliemann in the pre-historic palace of Tiryns. Marvelously preserved specimens too were found in Pompeii and Herculaneum, notably a small specimen now in the Vatican, known as the «Aldobrandini Wedding,» and named from the villa near which it was found. The early Christians of Rome also used it in the decoration of the walls of the catacombs. In the Middle Ages this form of painting gave way almost entirely to mosaic. The 14th century, however, saw its revival in Italy, chiefly due to the epoch-making work of the Florentine Giotto (1276–1336). His decorations in fresco of the chapel of Santa Maria dell'Arena created a widespread movement in its favor. Soon it became the leading medium of art expression of his contemporaries and successors and culminated in the sublime achievements of Michael Angelo's ceiling of the Sistine Chapel and Raphael's stanze in the Vatican. Since the 18th century fresco painting has gradually fallen into disuse, and all attempts recently made in England and Germany to revive it have met with little success. At present, it is only pursued by a few Siennese mural decorators.

Of the early treatises on the technique of fresco may be mentioned 'Mount Athos Handbook' (Hermeneia, date uncertain); Cennino Cennini, 'Trattato della Pittura' (English translation by Christiana J. Herringham, London 1899). Modern manuals include Taylor, W. B. Sarfield, 'A Manual of Fresco and Encaustic Painting' (London 1847); Cremer, F. G., 'Volständige Anleitung zur Fresco-Malerei' (Düsseldorf 1891); Ward, 'Fresco Painting, its Art and Technique' (London 1909).

Fresco-Secco.— The form of painting known as *fresco-secco* is a spurious kind of fresco in which the colors are laid on to the plaster after it had been allowed to dry thoroughly. It is used in ordinary house decoration where the true fresco method is impracticable. The process is as follows: After plastering the wall with two coats of lime and sand as in true fresco it is allowed to dry. The surface of the plaster is then rubbed with pumice stone to remove the irregularities; and in the afternoon of the day before the artist intends to do the painting, the wall is saturated with water containing a small infusion of lime. The following morning, after again moistening the wall, the artist traces the outline by pouncing and commences the painting. When during the process of painting the wall becomes too dry, a syringe is employed to moisten it. The colors used are mixed with water or with water and lime as in *buon-fresco*. The advantages of fresco-secco are convenience and ease of execution. On the other hand, works produced by this system are opaque and heavy and the fixation of the pigments are not as complete as in true fresco.

Spirit Fresco.— «Spirit fresco» is the name given to a process of mural painting invented by T. Gambier Parry in 1883 and used with success by Sir Frederick Leighton in his decorations at the South Kensington Museum, England. Great durability is claimed for it by its inventor, and it is now very popular in Great Britain. The wall to be painted in «spirit fresco» is prepared with two coats of plaster as in true fresco; and the surface of the second coat or *intonaco* is left rough, as all smoothing processes destroy its porosity — a quality which is absolutely essential in this system of painting. The use of plaster of Paris and cement are avoided for the same reason. When thoroughly dry, the wall is well drenched with the special medium of the pigments used in this process, diluted in one and a half its bulk of spirits of turpentine. The recipe for the medium as given by Mr. Gambier Parry is as follows: elemi resin (*gum elemi*) two ounces by weight; pure white wax, four ounces by weight; oil of spike lavender, eight fluid ounces; and artists' copal resin, 20 fluid ounces. A few days after spraying the ground is painted thickly with two coats of the medium, slightly diluted with about a third of turpentine and mixed with equal parts of powdered white lead and gilders' whitening. Before proceeding to paint on it, the surface, thus prepared, is allowed to dry for two weeks, at the end of which time it becomes a luminous white, so that all color tones applied on it assume the clearness and brilliancy of true fresco. The painting is done boldly and solidly, using spike oil freely as the solvent. The theory of the process is the saturating of the ground with a solution that forms at the same time the vehicle of the pigments, so that when dry, the whole forms a homogeneous mass. The advantages claimed for it are: (1) durability; (2) power to resist damp and foul air; (3) luminosity of color; (4) a dead surface. Consult Parry, T. Gambier, 'Spirit Fresco Painting' (London 1883).

Stereochromy or Water-Glass Painting.— Stereochromy (from the Greek *στερεός*, *stereos*, solid, firm and *χρῶνα*, *chroma*, color) is a form of mural painting invented by the German chemist, Dr. J. N. Von Fuchs, in 1825, in which water-color is applied on dry plaster and fixed afterward by spraying with a substance known as *water-glass* (a silicate of potassium or of soda). Several different kinds of water-glass are employed. The formulas for the three most generally used are as follows:

(a) *Potash Water-Glass*, composed of 15 parts of pulverized quartz or pure quartz sand; 10 parts well-purified potash; one part powdered charcoal.

(b) *Soda Water-Glass:* 100 parts of quartz; 60 parts anhydrous sulphate of soda; 15–20 parts powdered charcoal.

(c) *Double Water-Glass:* 100 parts of quartz; 28 parts of purified potash; 22 parts of neutral anhydrous carbonate of soda; six parts powdered charcoal.

In preparing the wall-surface for painting in water-glass three coats of plaster have to be laid. The first two coats are composed of four parts of coarse quartz sand, infusorial earth and powdered marble, mixed in certain proportions to one part of quick-lime, slaked with distilled water. The last coat is composed of eight parts white quartz sand, powdered marble, and infusorial earth to one part quicklime. When the plaster is dry it is sprayed with a solution of hydro-fluo-silicic acid to remove the thin crust of carbonate of lime which forms on it during the process of drying. It is then saturated with two applications of potash water-glass diluted with distilled water, and when dry is ready to receive the painting.

The colors are ground with distilled water only. They are the same as in true fresco with the exception of lime white for which zinc white has to be substituted, as the former does not chemically combine with the water-glass. The colors may or may not be mixed with white. When white is mixed with the pigments, the painting is like an opaque water-color. When white is not used, the work corresponds to transparent water-color. The palette is constructed with small pans to hold the colors. At the end of the day's work the remaining color may either be replaced in the bottle or kept moist in the pan with distilled water.

The actual process of painting in this method is comparatively easy. The artist can paint thinly or in full impasto and may retouch the work at any time. When finished, the picture is sprayed several times with the fixing water-glass, diluted with half its volume of hot water, by means of a special sprinkler. The water-glass penetrates through the plaster to the wall, and in drying binds pigments, plaster and wall into one mass of silicate.

Stereochromy was practised considerably in Germany in the second half of the 19th century especially by Kaulbach, Pettenkoffer and Schraudolf. About the same time Godfried Guffens and Jan Swerts worked in this medium in Belgium. In England, Maclise and Herbert adopted this process in their mural decorations in the Houses of Parliament. Consult Kiem, A., 'Die Mineral-Malerei' (Wien 1881); Kremer, F. G., 'Beiträge zur Technik der Monumental-Malverfahren' (Düsseldorf 1895); Thomas, W. Cave, 'Mural Decoration' (London —).

Painting in Oil.— In oil-painting the pigments are ground in and mixed with an oil varnish and applied on metal, panel or canvas specially prepared. The process arose in northern Europe where the moist climate was not favorable for the development of tempera or fresco. The discovery of the medium has always been attributed to the brothers, Hubert and Jan Van Eyck, who flourished in Belgium about 1400 A.D. But this is erroneous, for as a matter of fact, olive, flax and nut oil were used in their works by painters long before the Van Eycks. On the authority of Eastlake whose 'Materials for a History of Oil Painting' is considered a classic, Aetius, a medical writer of the early part of the 6th century describes at great length linseed and nut oil as used by gilders and encaustic painters of his day. Besides, there is evidence to the effect that the medium was used in England as far back as 1239. It is true, however, that about the year 1400, the oil process became well established, due no doubt to the Van Eycks who, according to the writings of the Italian historian Bartolommeo Facio, had made a thorough study of the works of the preceding authorities. The system gradually gained popularity all over Europe — so much so, in fact, that by the end of the 15th century, it had become the dominant form of the graphic arts.

The methods of work of several of the old masters representing as many different schools of painting will now be described. The technique of Hubert Van Eyck was as follows: A panel of well-seasoned oak was prepared by being covered with *gesso* which is the Italian word for gypsum or plaster of Paris. On this non-absorbent surface he first made a careful outline drawing in ink or black chalk. He then primed the whole with a light, thin and uniform wash of color diluted with varnish, permitting the drawing to show through. This dry, he painted-in the shadows with a wash of transparent brown. On top of this monochrome he finally painted the subject in full color, taking care to keep the light parts so thinly covered with paint that the light ground peered through. This is the most primitive form of painting known; nevertheless, it introduced the idea of painting on a prepared monochrome which was taken up and used by the early Flemish and Dutch painters including Rubens, Teniers and Ruysdael. Rubens, however, improved greatly upon the method of the Van Eycks. In his work, brushwork and vivacity of handling generally became important qualities. He, too, painted shadows thin and transparent but loaded in the light parts. Rembrandt, besides the numerous other qualities which characterize a great artist, had great technical skill. He loved rough surfaces and indulged greatly in glazing (brushing transparent colors without admixture of white over a dried undertone) and scumbling (dragging opaque color over the undertone). His brushwork, too, was vigorous and convincing. Frans Hals, whose technique is the model for a great many modern portrait painters, discarded the monochrome system for direct painting. He laid in the shadows thinly, the middle tints substantially and the lights heavily. Titian first laid in his subject in substantial body-color but in simple colors, using, probably, white, yellow ochre, light red and black. After letting this first painting dry for several months, he glazed and reglazed with rich colors every part of the canvas including the high lights. He also scumbled or superimposed opaque color here and there until the work showed that rich surface for which his paintings are famous. His method resembles that of Rembrandt with the difference that Rembrandt indulged more in the scumbling process while he gave preference to glazes. The practice of all the modern painters is based upon one or another of the several methods described.

The materials and tools used in oil-painting include the foundations, pigments, media, driers, brushes, palette and palette knife. The foundations or the materials on the prepared surfaces of which the painting is executed include metal, wood academy-board and canvas. The roughened surface of thin sheets of copper or zinc make the finest grounds for oil-painting, but are not much used for large pictures on account of the great weight of the metal. Panels of well-seasoned oak or mahogany also make excellent surfaces and have been extensively used. Sketches and small studies are frequently made on a foundation known as academy-board, formed by covering with size and paint a surface made by pasting together several sheets of cardboard. Canvas for oil-painting is the most in vogue. It is prepared as follows: After stretching it tightly on a wooden stretcher, its surface receives a sizing coat of glue and water. When dry it is covered with three successive coats of white lead in oil slightly tinted with black, to produce a gray color.

The colors used by the Renaissance masters were practically the same as those known to the ancients, namely, white-lead, whitening (calcium carbonate), gypsum (plaster of Paris), yellow ochre, raw sienna, vermilion, red oxide of iron, burnt ochre, burnt sienna, lapis lazuli (ultramarine), malachite, terre verte, raw umber, bituminous earth, burnt ivory and lake (extracts of woods, fruits and berries). In recent times very many artificial chemical colors have been added, swelling the list given above to about 215. Out of these only about 15 are now generally used. All the others are fugitive: some of them are affected by sulphur gas or coal smoke; others by light; and others again are permanent when used alone, but deteriorate when mixed with other colors. The following pigments are recommended by the leading chemists and are used more or less by our best contemporary painters: zinc white — ivory black — yellow ochre — strontian yellow — cadmium yellow — cadmium orange — vermilion — rose madder — madder lake deep — burnt sienna — cobalt blue — French ultramarine — emerald oxide of chromium — viridian — burnt umber.

The medium in which the colors are ground and with which they are mixed in the process of painting is a combination of an oil and a varnish. Many different kinds of oils and varnishes were used in the various stages in the development of the process. Among the oils may be mentioned linseed, poppy and walnut oil; and among the varnishes, damar, sandarac, amber, copal, shellac and mastic. At present linseed oil and mastic varnish are mostly used, as they form the most reliable vehicle. Linseed oil is the oil extracted from flax seeds; and mastic varnish is the resin obtained from a small evergreen tree which grows in the Levant. To hasten the drying of their pictures some artists mix their pigments with one of several so-called "driers" now on the market, as, for example, copal megilp. Our best chemists, however, prohibit their use where permanence is desired, and recommend pure spirits of turpentine as the best and only reliable drier.

The brushes employed in this system are made of sable and hog's hair, flat or round. The palette on which the colors are mixed, consists of a thin square or oval piece of wood, generally walnut or pear, hollowed out at one end with a hole through which the thumb is passed. Before laying the pigments on the panel or canvass, they are mixed on the palette with the palette knife — a strip of horn or flexible metal and generally triangular in shape. Some painters of the modern impressionistic school use the knife as much as the brush in the actual process of painting. Consult Eastlake, Sir Charles, 'Materials for a History of Oil Painting' (London 1847–69); Berger, 'Beitrage zur Entwicklungsgeschichte der Maltechnik' (Munich 1897–1904); Dalbon, 'Les origines de la peinture a l'huile' (Paris 1904); Ludwig, 'Über die Grunsätze der Oelmalerei' (Leipzig 1876); Vibert, 'La science de la peinture' (Paris 1890); Toch, 'Materials for Permanent Painting' (New York 1911).

Pastel.— Pastel is a process of painting in which variously colored crayons are used. The name is derived from the Italian word *pastello* — a little roll of paste — referring to the "paste" into which the colored crayons are first made.

The materials used in the practice of this art include pastels or colored crayons, tinted paper or specially prepared millboard or canvas, and fixative. To make pastels, the coloring substance is first mixed with a colorless base. This combination is then worked by means of a mucilage into the consistence of a soft paste which is formed into small cylinders about two inches long and three-eighths of an inch in diameter. The colors employed are with few exceptions those which are used in oil-painting. The bases or the materials employed to impart body to the colors and to secure light graduations or tints include chalk, pipeclay plaster and oxide of bismuth. Gums arabic and tragacanth are used to bind the molecules of some of the crayons and beeswax of others. The pastels are sold in boxes assorted either for flesh tints or landscape tones. A box usually contains 40 or 50 crayons, hard, medium and soft, giving for each color the gradation of tints from white to the natural tone.

Almost any kind of paper may be used in pastel painting, but those are most suitable which best retain the fine powder of the crayon. The kind specially manufactured for the purpose is the pumice paper — a paper prepared with a coat of starch and charged with pumice powder. To the surface of this paper the pastels adhere tenaciously and are easily blended on it. Besides, a painting executed on this paper can be retouched as often as is necessary without fear that the surface will refuse the crayon. Some pastelists use panels of wood, millboards and even canvas prepared with a pumiced surface. The paper, panel or canvas can be had tinted in many colors — blue, gray, buff, straw, olive and drab. A warm gray is preferred by many for portraits, and a low-toned olive tint is best adapted for landscape studies.

The method of working in pastels is as follows: the general tones of the subject are first rubbed on to the surface of the paper or panel with hard pastels, using the fingers or a stump made of gray paper or the pith of the willow. On these the work is continued and finished in decided touches for accent and texture which are left undisturbed. In comparison with oil-painting, pastel handling is decidedly easy. A skilful artist can complete a study in one sitting. This facility and rapidity are due to the nature of the dry colors used, which may be removed at will, superimposed, left and resumed at any stage and carried to any degree of finish. It forms, therefore, an invaluable medium in which to secure memoranda from nature in cases where it is necessary to seize fugitive effects of light and shade. For the same reason it is very useful for composing arrangements of color in pictures.

Like all the other forms of painting it has its qualities and defects. Its qualities include charm, delicacy, refinement and brilliancy of color. On the other hand, paintings in this medium are easily effaced and injured by foul air or damp. Therefore, when finished, they are generally "fixed" by a special fixative — the *fixatif Lacase* — and placed under glass.

It is uncertain to whom is due the merit of the invention of pastel; but there is no doubt that the German landscape painter, John Alexander Thiele (1685–1752), and his contemporary, the Venetian Rosalba Carierra (1675–1757), were the first to carry the art to perfection. Admirable pastel studies of heads and figures in red, blue and black were made by the Frenchmen, Boucher, Watteau and Greuze, and in full color by Nattier (1685–1766), Chardin (1699–1779) and Quentin de la Tour (1704–88), universally proclaimed the greatest pastelist of all times. The first to produce pastels of landscapes and marines was Simon Mathurin Lantara (1729–78). In England, John Riley (1646–91) was the first to practise the art. Later Francis Cotes (1725–70), a pupil of Rosalba Carierra, and John Russel, R.A. (1747–1806), produced pastels which are vigorous and brilliant in color. On the whole, it may be said that in England and still more in the United States this art has never reached a high state of development. In short, pastel is essentially the art of France.

Water-Color Painting.— What is known as water-color is a form of painting in which the medium is water slightly enriched by gum honey or glycerin to make the colors adhere. It was used extensively for decorative purposes by the mediæval monks in their illuminated manuscripts. The art of painting pictures in water-colors, however, was not evolved from these manuscripts, but rather from the pen drawing on paper by the old masters. The Renaissance painters frequently shaded their drawings with flat auxiliary washes of bistre, sepia or India ink. Later the pen outlines were replaced by markings with the brush and full modeling was undertaken in the brown or ink washes, resulting in the full water-monochrome. These monochromes were sometimes tinted to suggested color. In the early part of the 18th century the water-color painters of England often used gray or neutral tint in their distances and a brown in their foregrounds. The progress from this modified monochrome to painting in full color was made by the gradual introduction of blue into the gray, and gold, red and green into the brown. The artists who were the first to produce polychromatic water-color pictures are Paul Sandby, Robert Cozens and Thomas Girtin who flourished in England during the latter half of the 18th century. In J. M. W. Turner (1775–1851) the art reached its highest state of development. In continental Europe and in America water-color has for generations been undervalued as a slight and frivolous medium and has been consequently little practised. However, since 1870, when its qualities became better known, it has been employed by many eminent artists of France, Germany and the United States as an independent form of expression. At present there are special water-color societies in London, Berlin, Paris and New York which hold annual exhibitions.

As practised to-day, there are three kinds of water-color painting. The first, called transparent water-color, is based upon the principle that the light is to come from the paper. The color is applied in relatively thin, flat and transparent washes depending upon the light paper to give the luminous effect. For example, the pale portion of a greenish blue sky near the horizon on a sunny day will be painted with cobalt blue and a tinge of bamboge, much diluted with water. The light paper will decidedly peer through this transparent wash making the tone a light and luminous greenish blue. In the darker portion of the sky, as at the zenith, the color applied will be less diluted with water and consequently less transparent; the paper will shine through less making the tone a deeper blue. In the second form of water-color painting light gradations are obtained by mixing opaque white with the pigments and is, therefore, called opaque water-color. The third process consists in the free use of transparent, semi-transparent and opaque tones and is the system now most generally employed. Water-color pigments are sold either in porcelain trays or in tubes. In the tray system the colors are taken up from the trays by the brush charged with water; in the tube system the colors are pressed out from the tubes on to the palette where all mixing takes place. The objections to the tray colors are that they wear out the brushes, and it is impossible to get out a sufficient amount of color at once for certain purposes. Consequently tube colors which are more convenient are more popular. The brushes used in the water-color process are either camel-hair or sable, and the best papers are those named Whatman, Canson, Creswick and Harding. Consult Herrick, H. W., 'Water-Color Painting' (New York 1882); Monkhouse, Cosmo, 'The Earlier English Water-Color Painters' (2d ed., London 1897); Hamerton, 'The Graphic Arts' (Boston 1882).

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PAINTING IN THE UNITED STATES.

The record of American painting does not present the regular developments that are found in the histories of the great schools. There has been no artistic tradition strong enough to unify the efforts of succeeding generations of artists nor has there been for any considerable length of time a settled direction to popular taste. True, in the last century there appeared here an art with certain qualities more or less peculiar to itself and recognizable as differing from what was going on elsewhere, but its whole course was but the time of a man's life, and the ties that held it together were more the result of comparative isolation than any vital demand of national individuality. Our most characteristic artists are found in the latter part of this era which bequeathed to them a steady and single-minded outlook on their work while at the same time the new conditions granted them vivifying contact with the more vigorous arts of the Old World. To-day it is difficult to discern differences in aim between American and foreign pictures.

At the time of the planting of the American colonies the great European nations with the exception of England were in the midst of epochs of important artistic accomplishment, but Dutch, Flemish, Spanish, Italian, German and French painting left negligible or no results in the New World and no work of art of any merit seems to have found its way here in the early days. When the need for art made itself felt, after the great material difficulties had been overcome and life was somewhat stable, the most prosperous colonies being English it was from England that the artists came. They were called upon to paint portraits, and stiff lifeless effigies they made — imitations of Lely or Kneller. It was poor English work.

The earliest known painter of any excellence was John Smybert, a Scotchman who came to America in 1728 with Bishop Berkeley. He had studied under Sir James Thornhill, the best-known artist in London at the time, where he was a fellow-student with Hogarth. Smybert settled in Boston and painted many portraits, of which the most ambitious is the Family of Bishop Berkeley, now at Yale College, a composition of eight figures. His work was richer in color and more suave in aspect than that of the other early painters, who being engravers or else trained by engravers executed their paintings somewhat in the manner of engravings. Each part was finished separately and the adjoining part fitted to it as well as might be, producing hard dry edges and a total lack of atmosphere. In spite of these crudities or perhaps somewhat on account of them and certainly on account of the artists' simple and child-like point of view their pictures have a charm and also a very real decorative value in the interiors for which they were intended. The most worthy examples of this type of work are found in the portraits of Jonathan Blackburn who settled in Boston about 1750.

Both Smybert and Blackburn served as models for the one painter of real talent in the colonies, J. S. Copley. He was born in Boston in 1737 and was trained by his step-father, Peter Pelham, an engraver of merit and also a painter of portraits. In Pelham's house he had the opportunity of coming in contact with all that Boston afforded in the arts, as well as becoming cognizant of the engravings of the excellent portraits which were beginning to be produced in England. The knowledge of these Copley put to use in adapting from them general arrangements for his own youthful work as well as elegant accessories, rich costumes, jewels and the like — luxuries which the colonies could not furnish at that time. He was immediately successful and painted a great number of portraits (about 275 are known) before his departure for England just before the Revolution. Up to that time his work improved steadily. In England where he also prospered his paintings lost their peculiar flavor and he worked more and more in the manner of the acccomplished English artists of that day so there appears but slight resemblance between his late pictures and those executed in America.

Benjamin West, a Pennsylvanian, was of the same time as Copley. In the face of great difficulties he began the study of art (the story says he got pigment from the Indians) and soon made his way to London where he won the notice and friendship of King George III and attained a position of eminence. He was instrumental in inducing the king to found the Royal Academy and on Reynolds' death he succeeded to his position as its president. His bombastic pictures of religious, historical or allegorical subjects were executed in a formula vaguely founded on that of the then popular Italian eclectic painters of the 16th and 17th centuries. They were highly appreciated by his royal patron and many others of the time but have since fallen into complete disfavor. His lasting work was the encouragement he gave, during his whole career, to the young American painters who went to London to study, all of whom were his pupils.

Charles Wilson Peale was one of these. Though born in Maryland, his career shows him to have had the Yankee characteristic of ingenuity in any position he turned to — army officer, politician, mechanic, painter, he was all in turn, besides being the founder of the first American museum situated in Philadelphia where art works, curiosities and natural history specimens were exhibited. His portraits are like those of the earlier painters, stiff and wooden, but are the best which America could show for 15 or 20 years after Copley's departure. Another ingenious pupil of West's of about this time was Robert Fulton who after a passable success in his painting early abandoned it to devote himself entirely to his mechanical inventions.

A new phase of this period of American painting which displays an accomplishment worthy to be considered with the best of English contemporary work was ushered in on the return of Gilbert Stuart, a painter of great talent. He was born in 1755 in Newport, R. I., studied and practised his profession in England from 1775 until 1792 when he came back to his native country. Although a pupil of West no traces of West's influence appeared in his output. He founded himself rather on the English portrait-school then at its highest development. He was fortunate in his sitters, who included many of the prominent people of the early years of the republic, and he fixed for us the accepted type of likenesses of Washington. Three portraits of Washington it appears were executed from life — the first was destroyed, the second, a full length for Lord Landsdowne and the other the unfinished head now in the Boston Museum. From these he made many replicas, varying much in degrees of excellence. Stuart's interest centred in the heads of his sitters. He was apt to slur over all the other parts and never attempted elaborate compositions.

The best known of the later pupils of West were Allston, Malbone, Morse and Sully. These were the last of the Americans who accepted complete allegiance to the English school and with them ends the first period of painting in America. Washington Allston's importance is greater than his pictures. He was one of the few who felt the influence of the character of West's subjects and he was the first in America to paint pictures of an imaginative and poetic bent. His contemporaries rated him as a genius while we of to-day can only find in his work a sweet sensitiveness or a yearning for great things which he was unable to realize. He was of that not infrequent type of American artist who when withdrawn from the stimulus that excites him seems incapable of accomplishing what his career under more favorable conditions promised. S. F. B. Morse, one of the excellent portrait painters that America has produced, had in some of his works a rare feeling for vitality and character. His inventions were, however, too engrossing for his art and from the time he began to develop them he ceased to paint.

Malbone during his stay in London studied the English miniaturists, Cosway, Plimer and the others, to such advantage that his work in this branch of art remains the best that America has produced. Thomas Sully was born in England but came to America when an infant and learnt here the rudiments of his art. West's tutelage left no marks on his work but he formed himself with happy results on the study of Lawrence, Raeburn and Romnev. His career in America was long and successful. He lived until 1872.

With the growth of wealth and power in the early 19th century came a sense of national self-confidence which with the severance of the dependence of America upon the mother country brought about the gradual weaking of the force of English precedent. The younger artists relied more on the training that could be got at home and when they went abroad it was as artists not as students. They traveled in various places without attaching themselves to any one teacher. The changed conditions of life too in which the aristocracy of the older period was giving place to the crude force of the new democracy made itself felt in the pictures. Chester Harding who had been a peddler, innkeeper, sign-painter as well as artist, John Neagle and Henry Inman, who both worked somewhat in the style of Stuart and Sully, were then the principal portrait painters. William Mount and R. Caton Woodville began painting genre pictures of American subjects which were much prized by the picture buyers. But the principal activity was manifested by the landscapists. It was the period alluded to in the first paragraph of this article when painting in America had a character of its own. The delight in native scenery and the belief in its superior grandeur to anything the Old World could furnish were prevalent among both the public and the painters and furnished the common point of view which is the first requirement of a school of art. The high prices paid for these landscapes, the highest which any group of American artists have ever received, as well as the comments of the time, show their wide popularity. The artistic centres of other days, Boston and Philadelphia, with their traditions of colonial aristocracy yielded their places to New York, as that city owing to its commerce became the wealthiest of the country. The National Academy of Design was founded there in 1826. Most of the popular landscapes were those of views within reach of New York, particularly scenes of the Hudson River Valley, from which the popular name of the whole group, the Hudson River School, is derived. The New York picture buyer has thus the added interest of a knowledge of the localities represented; the pleasure of recognition of familiar sites being always a satisfaction for those who are new to the appreciation of art.

Thomas Doughty was the first of the group in that he painted many pictures of the Hudson River Valley without too obvious foreign influence. Asher B. Durand, somewhat his junior, did not devote himself exclusively to painting until middle age, up to which time he had worked at his profession of engraving. He traveled abroad, studied Constable and Turner and was interested particularly in the facts of landscape. He might be called the realist of the school in distinction to the idealist Thomas Cole who like West attempted allegorical subjects and ethical teachings in his pictures. Cole was born in England but came to America when 19 and soon took up the life of a wandering artist, doing whatever jobs he found. He later visited England, France and Italy and his pictures, more professional in appearance than those of his contemporaries, show the effect of his longer contact with Europe. His greatest success was with series of pictures of which the 'Voyage of Life,' with figures typifying infancy, youth, manhood and old age in boats on a river, and 'The Course of Empire,' four views of the same landscape showing four stages of the history of a city from settlement to destruction, were famous types.

The younger men ranged themselves under Durand or Cole according to their temperaments. Many of them started as engravers and their close imitation of detail often displays the engraver's method. John F. Kensett was the chief of those who followed Durand. He portrayed the native scenery as he and his clients saw it with successful financial results and his pictures which were once the furor of collectors still appeal in some instances on account of their probity and sincerity. As late as 1873, the year of his death, his vogue was unabated as is shown by the sale of the pictures and studies left in his studio for over $150,000.

Frederic E. Church who had a greater talent than any of the school was a pupil of Cole, from whom or from Turner's pictures of theatrical effect he imbibed the love of the "grand subject." And to make his subjects grand he not only chose the most immense views such as the 'Heart of the Andes,' or the most famous remains of art such as the excellent picture of the Parthenon, but combined physical and artistic wonders in one picture, as in the Ægean Sea where the Golden Horn, the Acropolis, a rock temple, sunset, rainstorm, a double rainbow are crowded together with ingenuity and considerable skill.

There were many artists who gained fame and fortune at this time, but the few names chosen are representative ones and may stand for the accomplishment of the whole number. Their success was confined to America with the exception of Church who won a considerable admiration from abroad. By the end of the third quarter of the century their popularity showed signs of waning. Artists who had had a thorough training in Munich or Paris had returned and their criticisms were beginning to have effect. The old order was passing and its descendants, men like Wyant, Martin and Inness, who inherited certain of its principles were enough in touch with foreign art to see and avoid the circumscriptions of their predecessors. With the enlightenment of the public, the assured connection between artist and client came to an end. Even Tuckerman, the enthusiastic chronicler of mid-century artists, admits that from European standards American artists were remunerated far beyond the market value of their pictures. It was due, he says, to the "sudden prosperity of an imperfectly educated class" who "with little discrimination, and as a matter of fashion devote a portion of their newly acquired riches to the purchase of paintings."

Of the landscapists who followed, Alexander Wyant more than the others was affiliated with the Hudson River School. His foreign training was secured in Germany. He painted native scenes in the spirit of Durand, but in place of a dry insistence on detail he succeeded in enveloping his paintings in an atmosphere and in expressing a poetic mood. Homer Martin was of the same calibre but more intense. His outside influences came from the French and some of his later paintings have an aspect which approaches that of the Impressionists. The merit of George Inness is still more prominent. Distinctly a visionary and romantic he combined the rich color of a Delacroix or a Dias with American motives. He had a lofty and what might be called a religious outlook on nature and many of his pictures have a grandeur that would be acknowledged in any company.

The most personal artist that America has produced, Winslow Homer, should be mentioned at this point. He began as an illustrator, making drawings for a magazine during the Civil War. His work at that time, as later, was distinguished by the grim determination to express the significant quality in each person or thing portrayed. His subjects at first did not differ from those of the figure and genre painters, his contemporaries, whose general training was similar to his, but he had what they lacked, a great talent and an inherent sense of what was properly the distinctive province of painting. When later he came in touch with foreign art (the influence of Courbet counts largely in his development) he was stimulated to great progress, keeping distinct his own point of view the while. In his youth he painted soldiers, negroes, genre pictures, such as were the subjects of his drawings for reproduction. These gave place to scenes of life in wild places with hunters, or fishermen, or sailors; to rugged landscapes of the seashore, or forest, or mountain streams — powerful pictures with a scorn for prettiness or decorative effect. All his works are imbued with the qualities which one likes to think of as American; they are straightforward, vigorous, even to uncouthness at times, and self-reliant. He was the Abraham Lincoln among painters.

Albert P. Ryder, also a distinct personality, is the antithesis of Homer in temperament. A poetic dreamer, timid and self-questioning, he produced but little. Certain of his pictures, however, rank with the best achievements of American art. No American has equalled his intensity of realization of imaginative themes. His training has been native and more or less haphazard. Each of his little pictures seems to be a fresh experiment but he attains a deep glow of beautiful expressive color at times and a rare quality of fused surface. His realm is the borderland between fancy and reality. He paints visions of old legends — fairy stories, gaunt trees by moonlit streams, boats on lonely seas. It seems almost impertinent to attempt to trace the parentage of so personal and sensitive a talent, but those who take an interest in such matters may find it was fostered by the smaller and simpler imaginative works by Cole or by an admiration for Turner.

Before proceeding to the present stage in our genesis, that of the painters thoroughly trained in foreign countries, mention must be made of George Fuller, who escaped from the tyrannies of fact by bathing his scenes in a dull, hazy atmosphere, where all outlines are blurred and all colors take on a tawny shade; and also of Thomas Eakins, who though he spent some time in Paris under Gérôme, never attempted the French methods of his fellow-students in the Beaux-Arts School. He was an uncompromising realist. His favorite subjects were portrayals of surgical operations at hospitals, prize-fights and the like, and his portraits, dull and heavy in color and surface, have a vigor of characterization and an intellectuality that gives them distinct value as documents of our time.

With certain reservations, what may be called the national period of American painting ends with these men. The beginning of our present cosmopolitanism took place not long after the middle of the century, when William M. Hunt returned from abroad and began practising his profession at a time when the Hudson River painters were in the heyday of their success. He had studied under Couture and was deeply influenced by J. F. Millet long previous to that artist's general recognition. His eloquent championship of the French art which he represented was instrumental in preparing for the change which was soon to take place. A gentleman of impressive personality, he never lacked his circle of admirers, but his art was alien to the public at large. The disassociation between artists and public which now prevails in America seems to have been inaugurated in his case. It is hard for this generation to appreciate how his excellent portraits could not have appealed to the people of the 60's or his subject pictures, generally arrangements of models, which were in a style compounded of Couture and Millet. In his decorations for the Albany State House, now covered over, he gave America her first mural paintings in a monumental style.

John La Farge was a friend and coworker of Hunt. He was born in America of French parents and took up the study of painting under Couture in Paris. He was a man of wide knowledge and attainments, and the profession of art was one of several possibilities which were open to his varied talents. His chief activity was in the field of decoration of wall surfaces and more famously of windows in stained glass in a method of his own, the foundation of which was a glass made of two or more colors fused together imperfectly in the same piece instead of flat colors formerly used. La Farge's example has been widely felt, particularly in church decoration, but in both his career and in that of Hunt the promise of the talent seems inadequately fulfilled.

While Inness, Homer, Hunt and La Farge were working their way to a somewhat restricted appreciation, the general taste was still loyal to the great reputation of the time of the Civil War and before. It remained so until the late 70's. By then a number of young artists, thoroughly equipped in the Munich and Paris schools, had returned home and were sending their works to the exhibitions of the National Academy. Dissatisfaction with the places which their pictures were accorded in these exhibitions led to the formation of the Society of American Artists in 1877. For more than a score of years the exhibitions of the society represented the European influence in American art, at the end of which time the European ideals having generally prevailed and the aspect of the exhibitions of the rival associations having become practically the same, the society was merged into the academy. Since the formation of the society with the exception of the work of a few artists of strong individuality or of those who were formed under the old régime, American painting has echoed either the Munich or the French fashions. The most famous of the Munich men are William M. Chase and Frank Duveneck. In the category of those who have imported the rapid and vigorous developments of the French school the names are many. From the impressionist movement which produced John Twachtman, Alden Weir and recently Ernest Lawson, up to the late phase of the disciples of Cézanne, which has given us Maurice Prendergast, John Marin and Max Weber, Americans have expressed their versions, often very personal ones, of the æsthetic ideals of Montmartre and Montparnasse. Arthur B. Davies has retained up to recently his independence from the foreign ideals of the time. In his earliest work he showed himself a romantic of the Ryder sort but with a greater vitality than that artist. His pictures of legend and fancy or of noble landscape peopled with creatures of his imagination are distinguished by a very individual composition and an exquisite sense of color and form. He has lately exercised his rare gifts in a method adapted from the principles of the so-called Cubists, whose prophet is Picasso, a developer of the style of Cézanne.

Of the cosmopolitan painters, two have attained world-wide fame — Whistler and Sargent. Both made Europe their home. James McN. Whistler was a contemporary of La Farge and the junior of Hunt by but 10 years. His artistic training was entirely European, only a few years of his youth having been spent in this country. Super-refinement and sensibility are the keynotes of his character. Strange to say he was influenced by the most rugged of all 19th century painters, Gustave Courbet, whose work was the stimulus to so much of the later art. Whistler was egotistical and conceited, but in his painting he displayed a real genius. His work at various times shows widely different inspirations — Courbet, as has been mentioned, certain contemporary English painters, Velasquez and the early 19th century Japanese — but always has the same charm of sensitiveness and delicacy. His themes were those of reality, but the vagueness and mystery of twilight pervade his lovely canvases. He painted portraits in which the subjects appear to have the artist's own characteristics of nervousness and preciousness; landscapes in which a view that may be of factory chimneys and ugly bridges is made to look as exotic as a glimpse of Tokio in a print by Hiroshige;

pictures where a London garden resort at night with strolling or dancing pleasure-seekers in prosaic clothes takes on the aspect of a festivity in a fairy-tale. He ranks with distinction among the group of Frenchmen of whom Degas and Manet are the principal names.

John Sargent has had even less connection with America than Whistler. He was born abroad of American parents, studied in Paris under Carolus Duran and has since lived continuously in England. His career has been unvaryingly successful both in popular approval of the better sort as well as in the admiration of his fellow-artists. His work, largely portraits, from the first assumed the manner for which he is still famous, a striking likeness accomplished with a swift and fluid brush-handling. He does not seem to interest himself in profound characterizations as much as in peculiarities of appearance so that in certain instances his work approaches to the border of caricature. In the last few years he has confined himself to a series of paintings of religious subjects for the decoration of the Boston Public Library and to small pictures of landscapes with figures, all of which are marked by the same remarkable vision and the same nimbleness of hand that his portraits exemplified. Contemporary portrait painting in this country has been largely influenced by his work.

Only the fewest necessary names out of the many that might have been mentioned have been commented upon in this cursory account. Our art history might be epitomized in one paragraphs as follows: From the end of the 17th century when the practice of art began in the colonies up to the second quarter of the 19th century it was purely English and this English period was prolonged in isolated cases for the lifetime of its representatives. The native school had its rise in the early part of the 19th century, attained about 1825 pre-eminence which lasted until the late 70's, and which was wrested from them by the foreign-trained artists. Among the latter were working certain painters who infused qualities of the native school with the foreign outlook, but broadly speaking the later painters are frankly cosmopolitan and have taken their places, often highly honored ones, in the company of their fellow-artists of Europe.

For the sake of brevity, qualifications which should have been made to some of the statements of this article have been omitted. Isham's 'History of American Painting' (which contains a bibliography) is recommended to those who wish fuller information as to the facts. Consult Bryant, L. M., 'American Pictures and their Painters' (1916).

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PAINTINGS OF THE GREAT MASTERS. The 12 most famous paintings are: Leonardo da Vinci's 'Last Supper,' 'Mona Lisa'; Raphael's 'Sistine Madonna'; 'Madonna of the Chair'; 'La Belle Jardinière' and 'Transfiguration'; Michelangelo's 'Last Judgment'; Rembrandt's 'Night Watch'; Correggio's 'Nativity' (*Notte*) and 'Magdalen Reading'; Rubens' 'Descent from the Cross'; and Guido Reni's 'Aurora.' An entire encyclopedia would be required to catalogue, classify and describe *all* the celebrated paintings of *all* the great ancient and modern masters and to show the progress of art and the characteristics of the "schools," or various groups of painters. Here is given an account of the most celebrated paintings and kinds of paintings, from ancient times to the present; in other words, from the Greek Zeuxis to the Spanish Zuloaga,— a period from 450 B.C to the year 1919. The article is arranged thus: I. Ancient; II. Early Christian Art; III. Religious; IV. Portraits; V. Military, Guilds and Historical Events; VI. Landscapes; VII. Marines; VIII. Animals and Birds; IX. Flowers, Fruits and Still Life; X. Architecture; XI. Genre; XII. Mythological and Fanciful; XIII. Bibliography.

I. Ancient.— Painting was highly developed 4,000 years ago, as wall-decorations in Egyptian tombs show. No Grecian paintings have come down to us, but there are records of artists and their works. The 'Taking of Troy' and 'Visit of Odysseus to Hades,' painted by Polygnotos of Thasos in the public hall of Delphi, were admired by Pausanias, who saw them 600 years after their execution. 'Helen,' painted by Zeuxis of Heracleia (born about 450 B.C.) for a temple of Hera in Croton, was one of the great works of antiquity. Zeuxis painted a 'Bunch of Grapes' so perfectly that some birds flew toward it and pecked at the shining globes. Parrhasios of Ephesus invited Zeuxis to come and see his new picture. On arriving in the studio Zeuxis asked him to draw aside the curtain and show it to him. The curtain was the picture! Apelles of Cos, who worked between 350 and 310 B.C., was considered even greater than those painters. His 'Venus Anadyomene,' the goddess rising from the sea, executed for the temple in Cos, was carried to Rome by Augustus, who remitted tribute to the island because of it. Apelles also painted a portrait of 'Alexander the Great,' as Jupiter, for which he received 20 talents (about $25,000). Roman painting followed Grecian styles. In Julius Cæsar's time Timomachus of Byzantium enjoyed a great reputation. His 'Ajax and Medea,' celebrated in epigrams, was bought by Cæsar for 80 talents ($100,000) and placed in the temple of Venus Genetrix.

II. Early Christian Art.— The ideal of the Christian, differing from the Greek, developed a new art; but the earliest examples of Christian painting (Catacombs of Rome and Naples) show classical treatment: Christ as Orpheus taming wild beasts by the sound of his lyre; Christ as a shepherd; Elijah going to heaven in a chariot like Apollo's, etc. Paintings were figurative and expressed doctrines. In the first years of the Christian Church the Virgin was represented alone and as an Orante — her arms extended in the act of prayer as then practised. After the Council of Nice (324 A.D) churches were dedicated to the Virgin, and she was represented as Queen of Heaven. After the Council of Ephesus (431 A.D.), when the doctrine of the Incarnation was established, the Virgin and Child were painted together. The art of the painter followed the teachings of the pulpit. (See CHRISTIAN DOCTRINE, DEVELOPMENT OF). The "Assumption" — the Virgin coming to life and rising bodily into the air — began to be painted in the 11th century. The "Coronation of the Virgin» became popular in the 13th century. The Virgin as the «Immaculate» one dates after the Council of Trent (1545), which settled Mary's genealogy. As the *Immaculata* Mary stands apart from mankind, even from her son. The first pictures show her standing on the moon and crowned with stars — a poetic idea. Murillo (1618–82), who painted the most beautiful examples of the «Immaculate Conception» (particularly the one in the Louvre), placed the crescent moon in the clouds below the feet of the Virgin. The «Madonna in Glory»— sitting or standing in the clouds with the child in her lap, or in her arms — was a painter's vision rather than an ecclesiastical idea. It made its appearance in the time of Raphael. One of the finest examples is his ‘Madonna di Foligno,’ named from the town of Foligno in the background. It shares a room in the Vatican with Raphael's ‘Transfiguration’ and the ‘Last Communion of Saint Jerome,’ by Domenichino (1581–1641); the ‘Sistine Madonna’ (Dresden), also represents the Madonna in glory.

III. Religious.— Giovanni Cimabue, born in Florence in 1240, is the connecting link between the ancient and modern idea. Cimabue ends the long Byzantine line of painters that had flourished in Italy from the time of Constantine to the 13th century. His most celebrated Madonna was painted for the church of Santa Maria Novella, Florence, to which it was escorted from the artist's studio in a triumphal procession. It has never been removed. In the angular Byzantine type of the «Madonna of Santa Maria Novella,» there is an attempt at human expression and the Child holds out his hand in a way that was novel in the 13th century. The adoring Angels are conventionally Byzantine. Giotto (1266–1337), the shepherd boy discovered and trained by Cimabue, was the first to seek inspiration from nature. His frescoes in Florence, the life of ‘Saint John the Baptist’ (Peruzzi Chapel) and the life of ‘Saint Francis’ (Bardi Chapel), became models for future generations. While Cimabue and Giotto were fusing new life into Byzantine traditions, the Sienese painters were doing the same. Duccio di Buonensegna (1260–1340) produced a ‘Madonna and Child’ surrounded by 20 angels, six saints and four patrons of Siena. The work was carried in a procession to the Cathedral of Siena. Duccio shows more grace and charm in his figures and faces than the Florentine masters. Simone Martini, often called Simone Memmi (1284–1344), holds the same place in the Sienese School that Giotto does in the Florentine. Painting now developed rapidly in Italy and in the Low Countries, where Jan (1391–1440) and Hubert van Eyck (1366–1426) perfected the art of painting in oil. Most of the early or «pre-Raphaelite» paintings were religious, although the madonnas and saints appearing in them are models from the artists' friends or families, and the landscape backgrounds familiar and loved scenes. The «Madonna and Child» was the most popular of all subjects. Sometimes they are represented alone, sometimes with the little Saint John, or with Saint Anne, or Saint Joseph or with a group of saints. The madonnas of Raphael are the best loved. The ‘Sistine Madonna’ (Dresden) is, perhaps, the most famous of all paintings. It was painted on canvas for the Cistercians of San Sisto of Piacenza in 1515–16 and sold by a later generation of monks to Augustus III of Saxony. Altar hangings are seemingly drawn back to reveal the vision of the Virgin floating in heaven holding a child of mysterious beauty and surrounded by angel heads and clouds. Pope Sixtus looks upward and Saint Barbara looks downward at the two angel children, who gaze in rapture at the beauteous Virgin. Next in popularity comes the ‘Madonna della Sedia’ (Pitti), painted in 1515. This «Madonna of the Chair» is full of tender maternal feeling and is intensely human. Almost as beloved is the Madonna with the Infant Christ and Saint John (Louvre), known as ‘La belle Jardinière.’ Little Saint John holds a cross before the Child, who looks at his mother questioningly. The landscape is exquisite and the pose of the Virgin graceful and distinguished. The same group appears in the ‘Madonna del Cardellino’ (Uffizi), in which Saint John offers Jesus a goldfinch, whence the name. Raphael's ‘Holy Family,’ known as ‘The Pearl,’ passed into England to Charles I with the Gonzaga collection. When Philip IV purchased it, he exclaimed: «This is my pearl!» The name has clung to it. Another famous work is the ‘Virgin of the Rocks’ (Louvre and replica in National Gallery, London) by Leonardo da Vinci (1452–1519). Of particular grace and fanciful loveliness are the madonnas by Botticelli (1447–1510): ‘Madonna of the Magnificat’ (Louvre), ‘Madonna of the Melegrana’ (Uffizi) and ‘Rosebush Madonna’ (Uffizi). The ‘Madonna of the Cherries’ (Vienna) by Titian; the ‘Madonna of the Cut Pear’ (Vienna) by Dürer (1471–1528); and the ‘Meier Madonna’ (Darmstadt and copy in Dresden) by Holbein (1497–1543) are celebrated.

The ‘Annunciation’ was the next favorite subject to the Madonna and Child. The angel Gabriel always stands on the left side of the spectator. Early pictures show him empty-handed. In the great pictures of the Renaissance he bears the «Annunciation Lily.» The greatest of all «Assumptions» is the one by Titian (1477–1576) in Venice. The ‘Adoration of the Magi’ (illustrating the doctrine of the Epiphany), afforded a fine opportunity for wealthy men of distinction to pose as the Three Kings offering gifts to the Holy Child. Among the greatest are by Ghirlandajo (Hospital of the Innocenti, Florence); Botticelli (Uffizi and Hermitage); Veronese (Dresden), Lochner (15th century) in Cologne Cathedral; and Rubens (Antwerp and Prado, Madrid). Correggio's ‘Notte’ (Night) or ‘Nativity’ (Dresden), is an ‘Adoration of the Shepherds.’ It is particularly famed for its effect of light, which radiates from the Holy Child. One of the most celebrated of all pictures is the ‘Last Supper,’ Leonardo da Vinci (1452–1519), painted on the wall of the Refectory of Santa Maria delle Grazie, Milan. It has almost faded from view. «The Descent from the Cross,» Rubens (1577–1640), another masterpiece, was removed from Antwerp Cathedral for safety during the German invasion in 1914. Raphael's ‘Transfiguration’ (Vatican) left unfinished by Raphael, was hung over his bier. The most famous head of Christ is, the ‘Ecce Homo’

(Dresden), Guido Reni (1575–1642). The most noted modern pictures representing Christ are the 'Light of the World' (Keble College, Oxford), Holman Hunt (1827–1910), and 'Christ before Pilate' (John Wanamaker, Philadelphia), Munkacsy (1844–1900). Other religious paintings in the front rank among masterpieces are 'The Last Judgment' (Sistine Chapel) by Michelangelo (1475–1564); the 'Last Judgment' (Campo Santo, Pisa) attributed to Orcagna (about 1308–68) and also to the Lorenzetti brothers of Siena; the great altar-piece, the 'Adoration of the Lamb,' by Jan and Hubert van Eyck (Saint Baron, Ghent, panels in Berlin), 'Paradise' (Doge's Palace, Venice) with its 1,000 figures by Tintoretto (1518–94); 'Marriage at Cana,' by Tintoretto; the 'Mystic Marriage of Saint Catherine' (Louvre) Correggio (1494–1534); 'Marriage of Cana' (Louvre) by Veronese (1528–88); and 'Holy Grail' series (Boston Public Library) by Edwin Abbey (1852–1911).

IV. Portraits.—All great painters were great in portraits. They earned the chief part of their income by this means. Portrait-painting became an independent art in the 15th century. The Flemish and Italians executed marvels. The 'Man with the Pink' (Berlin) by Jan van Eyck (1381–1440); the 'Banker and His Wife' (Louvre) by Quentin Massys (1466–1530); and the 'Old Man and Boy' (Louvre), the former with a terrible nose, by Ghirlandajo (1440–94), are remarkable examples of direct painting. Gentile Bellini (1426–1507) and Giovanni Bellini (1428–1516) are among the earliest Italian portrait-painters. Gentile's 'Portrait of Sultan Mahomet II' (Lady Layard) is famous, and Giovanni's, 'Doge Loredano' (National Gallery, London) is a great work of art. Donors of altar-pieces frequently had themselves represented on the panels and outside shutters and sometimes in the important central panel kneeling in adoration of the Virgin and Child. Wealthy merchants and artistic princes delighted in having themselves reproduced in magnificent attire in Adoration of the Magi. Female saints, as well as the Madonna, afforded the painters opportunity for perpetuating the faces and figures of loved ones. These wonderful women that look upon us from canvases, centuries old yet ever young and lovely, are real women dear to the painter,—his wife, or his love. For example, Raphael's 'Sistine Madonna' and 'Saint Cecilia' (Bologna) are idealized studies of «La Fornarina» (Barberina Palace), his one love; and Andrea del Sarto's handsome though shrewish wife, Lavinia Fede, posed for the 'Madonna of the Harpies' (Pitti) and 'John the Baptist' (Pitti). The most famous of all portraits is Leonardo da Vinci's 'Mona Lisa' (Louvre), with the enchanting smile, the wife of Francisco del Giocondo, whence its name 'La Gioconda.' Among Titian's magnificent portraits are: 'Lavinia,' his daughter (Pitti); 'Man with Glove' (Louvre); and 'Portrait of Himself' (Berlin). Raphael's great portraits are 'La Fornarina' (Barberini Palace, Rome); 'Pope Leo X, with Cardinals Guilio de' Medici and Luigi de' Rossi' (Pitti); 'Pope Julius II' (Uffizi and replica Pitti); and 'Balthazar Castiglione' (Louvre). The 'Portrait of a Tailor' (National Gallery, London), by Moroni (1510–78), is a masterpiece. 'Beatrice Cenci' (Barberini Palace, Rome), by Guido Reni (1575–1642), occupies a place by itself. The 'Concert' (Pitti) by Giorgione (1475–1511), is a group of portraits, superbly rendered. Hans Holbein the younger (1497–1543), painted masterpieces: 'Erasmus' (Louvre) and 'Georg Gisze' (Berlin) head his list.

Velasquez (1599–1660) produced magnificent works: 'Pope Innocent X' (Doria Palace, Rome); four pictures of the young 'Baltazar Carlos' (Prado, Madrid) and 'Las Meniñas' (Prado) or 'Maids of Honor,' in which he painted himself painting the group, are usually considered the greatest. The list of Rembrandt (1606–69) is long. In addition to many of 'Saskia,' his wife, and himself, those of 'Elizabeth Bas' (Rycks) and 'Old Woman' (Petrograd) are notable. Frans Hals (1584–1666), is ranked with Rembrandt. His 'Laughing Cavalier' (Wallace, London); 'Nurse and Baby' (Berlin) and 'Jester' (Rycks) have never been surpassed in dash, vigor and breadth. Of Rubens (1577–1640) 'Helen Fourment' (Hague) is the loveliest of the many of his second wife. The 'Chapeau de Poil' (National Gallery, London), is another famed example. Of Anthony Van Dyck (1599–1641), 'Charles I' (Louvre); 'Children of Charles I' (Turin); and 'James Stuart, Duke of Richmond' (Metropolitan Museum, New York), are masterpieces. 'Cardinal Richelieu' (Louvre), bv P. de Champaigne (1602–74); is noted. Hogarth (1697–1764) is one of the masters of portraiture: 'Lavinia Fenton as Polly Peachum' and the 'Shrimp Girl' (National Gallery, London) stand high. The beauties of the court of Charles II, particularly 'Barbara, Duchess of Cleveland,' as 'Minerva,' by Sir Peter Lely (1618–80), deserve their reputation. The French Nattier (1685–1766) painted with lovely color and fancy: 'The Duchesse de Chartres' (Stockholm) in mythological costume is exquisite. In the front rank are placed Thomas Gainsborough (1727–88) and Sir Joshua Reynolds (1723–92). Gainsborough's 'Mrs. Siddons' (National Gallery, London); 'The Blue Boy' (Duke of Westminster); and the 'Duchess of Devonshire' (the stolen picture recovered and bought by the late J. P. Morgan) and the 'Hon. Mrs. Graham' (National Gallery, Edinburgh) are noted for their distinction and style. Sir Joshua Reynolds list of superb works is too long to enumerate. 'Mrs. Siddons as the Tragic Muse' (Duke of Westminster and sold in 1919, replica Dulwich); 'Nellie O'Brien' (Wallace, London); 'The Strawberry Girl' (Wallace); and 'Age of Innocence' and 'Angel Heads' (both in the National Gallery, London) are the favorites. George Romney (1734–1802) is celebrated particularly for his lovely portraits of 'Lady Hamilton.'

American painters succeeded early in portraiture. Gilbert Stuart (1775–1826) is noted for his 'Washington' (Museum of Fine Arts, Boston). 'General Dearborn' (Art Institute, Chicago) is another fine example. Among other notable works are 'Alexander Hamilton' (Metropolitan Museum, New York), by John Trumbull (1756–1843); 'Fanny Kemble' (Pennsylvania Academy of Fine Arts, Philadelphia), by Thomas Sully (1783–1872); 'Mr.

DE VINCI.
REMBRANDT.
GUIDO RENI.
RUBENS.
CORREGGIO.

and Mrs. Izard' (Museum of Fine Arts, Boston), by John Singleton Copley (1737–1815); 'Portrait of the Artist's Mother' (Louvre), Whistler (1856–1916); 'Beatrice Goelet' (privately owned) and 'Carmencita' (Metropolitan Museum, New York), by John S. Sargent (1850); and 'Lady with the White Shawl' (Pennsylvania Academy of Fine Arts, Philadelphia), by William M. Chase (1849–1916).

Among other famous modern portraits are the 'Lady with the Glove,' his wife, painted in 1869, (Luxembourg), by Carolus-Duran (1837) and 'Daniel Zuloaga and his Daughters' (Luxembourg) by Zuloaga (1870).

V. Military, Guilds and Historical Events. — In the Low Countries civic guilds and military companies were fond of having their portraits painted in groups. Chief among these paintings is Rembrandt's 'Night Watch' (Rycks), one of the most celebrated of all paintings. His 'Syndics' (Hague), a group of cloth-merchants, and 'Lesson in Anatomy' (Hague), a group of doctors, come next. The 'Banquet of Arquebusiers' (Rycks) by Bartolomeus Van der Helst (1630–70) is a wonder of realistic painting and splendid color. 'Saint George's Guild Banquet' and 'Saint Andriaen's Doelen' and other groups (Haarlem), by Frans Hals (1584–1666) are magnificent. Famous military works are: 'Friedland — 1814' (Metropolitan Museum, New York) by J. A. Meissonier (1813–91) and 'Champigny' (Metropolitan, New York), by Detaille (1848). Pictures commemorating historical events are numerous. Rubens painted many such, including the famous series of 'Henri IV and Marie de' Medici' (Louvre). Notable works are: Velasquez's 'Surrender of Breda' (Prado, Madrid); the 'Peace of Münster' (National Gallery, London), by Ter Borch (1608–81); the 'Coronation of Napoleon' (Louvre), by David (1748–1825); and the 'Signing of the Declaration of Independence,' 'Surrender of Burgoyne,' 'Surrender of Cornwallis at Yorktown' and 'Resignation of Washington' (Capitol, Washington), by John Trumbull (1756–1843); 'Washington Crossing the Delaware' (Metropolitan Museum, New York), by Leutze (1816–68), is entirely imaginary and owes its popularity to the subject.

VI. Landscapes.—Beautiful landscapes appear in early Italian and Flemish pictures, but are subordinate to the figures. The first great painter of light and air was the French Claude Lorrain (1600–82), who painted in and near Rome. Although his pictures have classical and scriptural titles, the interest centres in the landscape. The 'Embarkation of the Queen of Sheba' (National Gallery, London), is a fine specimen. The Dutch were early noted for their landscapes. The most famous Dutch landscape painter was Jacob van Ruysdael (1625–82). His 'Bird's Eye View of Haarlem' (Hague) and 'Waterfall' (Dresden) are among his best works. The 'Avenue of Middelharnais' (National Gallery, London), by Meindert Hobbema (1638–1709), is an extraordinary work. The great English line starts with Thomas Gainsborough (1727–88), whose 'Market Cart' (National Gallery, London) shows him at his best, and John Constable (1776–1837), whose 'Hay Wain' and 'Valley Farm' (National Gallery, London) are representative. 'Crossing the Brook' (National Gallery, London) by J. M. W. Turner (1775–1851) is considered one of the greatest landscapes ever painted. Constable greatly influenced the «Barbizon School» of French painters, who worked in the Forest of Fontainbleau. Famous pictures of this group are 'Dance of the Nymphs' (Louvre) and 'Ville d'Avray' (Metropolitan Museum, New York) by Corot (1796–1875) and 'The Gleaners' (Louvre) and 'Angelus' (privately owned, Paris) by Millet (1814–75). American landscapes of fame are: 'Niagara Falls' (Corcoran, Washington), Frederick Church (1826–1900); 'Sunset in the Woods' (Corcoran, Washington) and 'Delaware Valley' (Metropolitan Museum, New York) George Inness (1825–74); and 'Harp of the Winds' (Metropolitan Museum, New York), by Homer D. Martin (1836–97).

VII. Marines.— The most famous marines are 'The Wave' (Louvre) by Courbet (1819–1878); the 'Raft of the Medusa' (Louvre) by Géricault (1791–1824); 'Fighting Téméraire' (National Gallery, London) by Turner, and the 'Slave Ship' (Museum of Fine Arts, Boston) also by Turner (1775–1851); 'Fog Warning' (Museum of Fine Arts, Boston) by Winslow Homer, (1836–1910); 'The Breaking Wave' by Thomas Moran (Carnegie, Pittsburgh); 'The Wave' (Pennsylvania Academy of Fine Arts, Philadelphia) by Alexander Harrison (1853); 'Roaring Forties' (Metropolitan Museum, New York) by Frederick J. Waugh (1861); and 'Beaching the Boat' (Hispanic Society, New York) by Sorolla (1862).

VIII. Animals and Birds.— Animal painting is ancient. Splendidly drawn animals often appear in Egyptian wall-paintings. The horses of Micon of Athens were famous. Leonardo da Vinci was one of the first Italians to paint horses well. Horses and other animals appear in the pictures of the Adorations of the Magi and Adoration of the Shepherds and the ass occurs in the Flight into Egypt and Christ's Entry into Jerusalem. Early in the 17th century animals began to take a conspicuous place in pictures. Rubens' horses in his Adorations of the Magi are splendidly painted. Rubens also painted camels. Very spirited are his pictures of the chase. Frans Snyders (1579–1657), who studied with Rubens, depicted with skill and vigor wild beasts, domestic animals, dead game and barnyard fowls. He also painted the animals in some of Rubens' works. Snyders took pleasure in representing a fight of animals or birds. In the 17th century the Dutch began to appreciate the beauty of animals grazing in green meadows; and their combination of landscape and animals has never been surpassed. Paul Potter (1625–54) is as great a landscape as an animal painter. His 'Young Bull' (Hague) is the most famous of all animal pictures. His 'Cow Reflected in the Pool' (Hague) is, however, a better work of art. The horses and cattle of Albert Cuyp (1605–91) are superbly executed; and his landscapes are so full of golden glow and misty air that he is called «the Dutch Claude.» The 'Promenade' (Louvre) is his most famous work. Mauve (1838–88) specialized on sheep and his many works are of uniform excellence. Nearly every gallery of any size has a cow or cattle by Constant Troyon (1810–65), one of the Barbizon group. His 'Cattle going to

Work' (Louvre) is one of the most popular of all animal pictures. The 'Sheepfold' (Metropolitan Museum, New York), by Charles Jacque (1813-94) is startingly true to life. The chickens scratching in the straw are as realistic as the sheep. The 'Horse Fair' (Metropolitan Museum, New York) by Rosa Bonheur (1822-99), so full of dash and vigor is known far and wide. Her 'Oxen Ploughing' (Luxembourg) is of equal merit. The European galleries contain fine examples of the great French animal painters, Jean Baptiste Oudry (1686-1745) and François Desportes (1661-1743). George Morland (1763-1804) was famed for his pigs. The subject is not pleasing, but Morland's composition, coloring and technique make his paintings attractive. He is a master of so-called «rustic genre.» His works command high prices. The most beloved of all English animal painters is Sir Edwin Landseer (1802-73). 'The Hunted Stag,' 'Alexander and Diogenes,' 'Dignity and Impudence,' 'King Charles Spaniels' and 'Shoeing the Bay Mare' are among other favorites in the National Gallery, London.

Birds have their specialists. They often appear as accessories in early Italian and Flemish masters, particularly the parrot. The great painter of the feathered tribe was Melchior de Hondecoeter (1636-95). He depicted living birds of rare plumage, fowls and dead game. Very famous is his 'Floating Feather' (Rycks) representing a group of chickens, geese and ducks in an attractive landscape. A tiny yellow feather dropped by a young duck floats on the pool. This is so lightly painted that it seems as if a breath would blow it away.

IX. Flowers, Fruits and Still Life.— The Dutch are noted for their flowers, fruits and still life. Jan van Huysam (1682-1749) produced works of great decorative beauty. His flowers are lovely, true to life and are beautifully arranged. Often he makes a *tour de force* by painting a dew drop trickling down a velvet or satin petal. His fruit pieces are equally fine. David De Heem (1570-1632) painted fruit, flowers, plates of oysters, cheese and bread, crystal glasses half full of wine, musical instruments and still life. Rachel Ruysch (1664-1750) was famous for her «flowers.» She often paints them growing around a log or lichen-covered stump in the woods, with butterflies hovering around them. For still life, particularly pots and pans, Willem Kalf (1630-93) has never been surpassed, although his pictures are nearly equalled by our American William M. Chase.

X. Architecture.— Artists of the 17th century had a great fancy for painting the ruins of ancient architecture in Rome and its vicinity. The fashion seems to have been set by Claude Lorrain, the French painter, and popularized by Piranesi, the etcher. In the paintings of Gentile Bellini (1427-1507) architecture becomes more than a background for Venetian and Constantinople scenes. Antonio Canal (1697-1768) called Canaletto, made a special study of Venetian architecture. He visited England and painted 'Eton College' (1746), a masterpiece. His pupil, Francesco Guardi (1712-93), almost equals him. His paintings show more color, but are less truthful in details.

The Dutch became famed for their architectural paintings. The two Hendricks Van Steenwyck, Pieter Neefs (1578-1656) Berckheyde (1630-93) and Emmanuel de Witte (1607-92), represented the interiors of churches with vanishing perspectives and much attention to minute detail and effects of light and deep shadows. The pictures of Jan van der Heyden (1637-1712) give faithful views of Dutch towns, market-places, little houses with «crow-stepped» roofs — all finished in miniature style. More artistic are the works of Pieter de Hooch (1632-81), valuable for interiors and exteriors of comfortable Dutch homes with courtyards arches, red brick tiles and open doors, through which light and air circulate freely. The mosques of Gérôme (1824-1904) are notable triumphs of architectural painting. One of the most striking feats of modern painting has been accomplished by Claude Monet (1840-), who painted a superb series of the façade of Rouen Cathedral under varied atmospheric effects and at different times of day and night.

XI. Genre.— Genre is the name given to a class of painting that represents scenes of ordinary life. Genre pictures are of small size and much studied and finished. The style was carried to perfection by the «Little Masters» of the Low Countries: Ter Borch (1608-81); Metsu (1630-67); Ver Meer of Delft (1632-75); Pieter de Hooch (1630-81); Jan Steen (1626-79); Teniers (1610-94); Ostade (1610-85); Frans Mieris (1635-81); Gerard Dou (1610-75); and other Dutch and Flemish painters. People sitting in a courtyard or in a well-furnished room enjoying a meal, or singing to lutes; a lady taking a music lesson; a doctor calling on a patient; a lady dressing before her toilet table; an officer bidding farewell to his love; a messenger delivering a letter; a card-party; an oyster supper; a cavalier drinking with friends; an old woman peeling apples; a butcher's shop; a kitchen; a village fair, or *kermesse;* a company of merry-makers at an inn; a family giving and receiving presents on Saint Nicholas day; a boy blowing soap bubbles; a girl opening a window; and skating scenes were all materials for the painters of *genre.*

In these pictures all the details of furniture, glass, china, household articles, fruit, flowers, food and musical instruments are rendered with minute care. The costumes of the 17th century — velvets, satins, lace-collars, fur-trimmed sacques, jewels and plumed hats are marvelously reproduced. Ter Borch's 'Satin Gown,' also called 'Parental Advice' (Rycks), is one of the most remarkable exhibitions of texture ever seen on canvas. Another 'Lady in White Satin' (Dresden), by Ter Borch, is almost its equal. Ter Borch's 'Music Lesson' (Louvre) and 'Officer with a Letter' (Dresden) are famous also. Other celebrated genre pictures are: Jan Steen's 'Merry Home Coming' (Rycks); 'Feast of Saint Nicholas Day' (Rycks); 'Parrot's Cage' (Rycks); 'Quack Doctor' (Rycks); 'Dancing Lesson' (Rycks); Dou's 'Dropsical Woman' (Louvre) and 'Woman with a Pitcher' (Metropolitan Museum, New York), by VerMeer of Delft. The 'Card-Players' (Dresden), by Caravaggio (1569-1669) would be classed as genre if it were not so large. Other works depicting scenes of everyday life but which cannot be called *genre* because of their size are: ‘Marriage à la Mode’ ‘National Gallery, London), by Hogarth; ‘Bénédicite’ or the ‘Benediction’ (Louvre), by Chardin (1699–1779); ‘L'accordeé de Village’ (Louvre) by Greuze (1725–1805); the ‘Huguenot Lovers’ (privately owned), Sir John Millais (1829–96); ‘Spanish Marriage’ (Metropolitan Museum, New York), Fortuny (1838–74); and ‘Duel after the Masquerade’ (Chantilly and replica Walters Gallery, Baltimore) Gérôme (1824–1904).

XII. Mythological and Fanciful.— Some of the most beautiful pictures represent mythological, allegorical or fanciful subjects. In this class are Botticelli's ‘Venus’ (Uffizi) and ‘Spring’ or ‘Primavera’ (Academy, Florence); Raphael's ‘Triumph of Galatea’ (Farnesina, Rome); Guido Reni's ‘Aurora’ (Rospigliosi Palace, Rome); ‘Parnassus’ (Louvre), Andrea Mantegna (1431–1506); ‘Sleeping Venus’ (Dresden), Giorgione (1478–1510), Titian's ‘Bacchus and Ariadne’ (National Gallery, London); Veronese's ‘Rape of Europa’ (Doge's Palace, Venice); Veronese's ‘Vision of Saint Helena’ (National Gallery, London); ‘Embarkation for Cytheria’ (Louvre), Watteau (1684–1721); the ‘Cruche cassée’ (Louvre), Greuze (1725–1805); ‘Jeanne d'Arc (Metropolitan Museum, New York), Bastien Le Page (1850–84); Correggio's ‘Reading Magdalen’ (Dresden); ‘Saint Genèvieve Marked with the Divine Seal’ (Panthéon, Paris) Puvis de Chavannes (1824–98); and the ‘Mirror of Venus’ (privately owned), Sir Edward Burne-Jones (1833–98).

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ESTHER SINGLETON,
Author of ‘Famous Paintings,’ etc.

PAIRING, in legislative and other assemblies, a practice by which two members belonging to opposite parties or factions agree that both shall be absent for a specified time, or that both shall abstain from voting on a particular question. Thus a vote is nullified on each side. The terms pairs and pairing-off are also frequently used.

PAIS, pä'ēs, **Ettore,** Italian archæologist: b. Borgo San Dalmazzo, 1856. Pais was elected director of the Museo Nazionali of Naples and also member of the Royal Academy of that city. His numerous archæological publications include ‘Storia di Roma’ (1898); ‘Il riordinamento del museo nazionali di Napoli’ (1902); ‘Perchè fui esonerato dalla direzione del museo nazionali di Napoli?’ (1905); ‘Ancient Legends of Roman History,’ translated by M. E. Cosenza (1905); ‘Ricerche storiche e geografiche sull' Italia antica’ (1908; English translation entitled ‘Ancient Italy: Historical and Geographical Investigations,’ by C. D. Curtis, 1908); ‘Storia critica di Roma durante i primi cinque secoli’ (1913).

PAISH, pāsh, SIR **George,** English economist: b. 1867. In 1881–88 Paish served as secretary to the editor of the *Statist;* from 1888 to 1894 was sub-editor, and from 1894 to 1900 assistant editor of that journal. After 1900 he was joint editor. He is a governor of the London School of Economics and member of the departmental committee of the Board of Trade on Railway Accounts and Statistics in 1906–08. He has also served as adviser to the Chancellor of the Exchequer and the British Treasury on financial and economic questions in 1914–15. Paish was knighted in 1912. He visited the United States during the Great War of 1914–18 in connection with international financial arrangements incident to the great conflict. His publications include ‹British Railway Position› (1902); ‹Railways of Great Britain› (1904); ‹Railroads of the United States› (1913); ‹Capital Investments in Other Lands› (1909; 1910); ‹Savings and Social Welfare› (1911).

PAISIELLO, pä'ē-zyĕl'lō, or **PÆSIELLO, Giovanni,** Italian composer: b. Taranto, 9 May 1741; d. Naples, 5 June 1816. After having received his musical education in the conservatory of Saint Onofrio at Naples in 1776 he went to Saint Petersburg, where he produced the opera ‹Il Barbiere di Siviglia.› After remaining at Saint Petersburg for eight years he returned to Naples by way of Vienna, where he composed 12 symphonies for large orchestra, and wrote the opera ‹In Re Teodoro.› In Naples he remained for 13 or 14 years, from 1785 to 1799, and during this time he composed some of the operas which were produced at the Neapolitan Theatre, and he was also made chapel master to Ferdinand IV. In 1802 he went to Paris to organize the music of the chapel of Napoleon, and while there excited much jealousy, but it was not until 1804, when his opera ‹Proserpine› had been produced and proved a failure, that he returned to Naples. Paisiello produced between 95 and 100 operas, besides 100 masses, requiems, etc. Among the most prominent of his operas may be mentioned ‹Dal finto al vero,› composed in 1777; ‹Il Marchese di Tulipano›; ‹Nina, o la Pazza d'Amore›; ‹La Molinara.›

PAISLEY, pāz'lĭ, Scotland, a manufacturing town of Renfrewshire, on the White Cart, about three miles above its confluence with the Clyde and seven miles west-southwest of Glasgow. It consists of an old town on the west or left and a new town on the east or right bank of the river, communicating by three handsome bridges. The most noteworthy building is the restored Abbey Church of a monastery founded in 1164 by Walter, son of Alan, the first of the house of the Stewarts. Other noteworthy edifice are the new county buildings; the old county buildings and prison, a quadrangular pile in the castellated style; the town-hall, an imposing building in the classical style; the Neilson educational institution; the buildings containing the free library and museum; the Coats Observatory and the Coats Memorial Church (Baptist). The city has several parks and owns a great part of its public utilities and workmen's houses. Paisley has been long noted for its manufactures, especially of textile goods. The shawl manufacture, introduced about the beginning of the present century, and long a flourishing industry, is not now a staple, but the textile manufacture is still large, though the chief industry is that of sewing cotton, for which Paisley is celebrated all over the world. Wilson, the ornithologist, the poet Tannahill, and Professor Wilson (Christopher North) were natives of Paisley, which possesses a bronze statue of the ornithologist and of the poet. Paisley, the mediæval *Passeleth,* is a town of ancient origin, having been at one time a Roman station under the name of *Vanduara.* Pop. 84,499. Consult Brown, ‹History of Paisley› (Paisley 1886).

PÄIVÄRINTA, pä'ē-vă-rĕn'tą, **Pietari,** Finnish author: b. 1827; d. 1913. Coming of a poor family, his early years were passed in a hard struggle to secure a competence and a position of influence. He was successful and for nine years sat in Parliament. His first work was a description of the social life of his country in the martial period of Charles XII entitled ‹Seurahunnan kosto,› which was followed by intimate descriptions of Finnish peasant life. Some of his shorter works have appeared in Swedish in the collection ‹Bilder ur Lifvet,› while others have been translated into German, Norwegian, Flemish and Russian.

PAIXHANS, pĕk'sän', **Henri Joseph,** noted French general: b. Metz, 22 Jan. 1783; d. Jouy-aux-Arches, 20 Aug. 1854. He entered the artillery after being graduated at the École Polytechnique, fought under the empire with great bravery, especially at the siege of Paris in 1814, and in 1848 became division commander. From 1830 to 1848 he was a member of the House of Deputies. Paixhans invented a howitzer called by his name, which carried a hollow shot and cylindrical, conically pointed shells, also of his invention. During the Crimean War he investigated the concealment of floating batteries. He wrote several valuable studies of army and navy ordnance.

PAIXHANS GUN. See Ordnance.

PAJOU, pą'zhoo, **Augustin,** French sculptor: b. Paris, 19 Sept. 1730; d. there, 8 May 1809. He became a pupil of Lemoine and won the Prix de Rome in 1748, after which he studied for 12 years at Rome. Upon his return he was elected to the Academy and was employed by Louis XVI to make statues of Buffon, Descartes, Pascal, Bossuet and Turenne. In the Louvre may be seen ‹Pluto Holding Cerebus in Chains,› ‹Psyche,› and a bust of Madame du Barry, together with other works executed by him. The sculptures of the Salle de l'Opéra at Versailles and the ornaments of the cathedral of Orleans and of the Palais Bourbon are typical samples of his work.

PAKAWA, pä-kä-wä'. See Pinto.

PAKENHAM, păk'ĕn-ąm, Sir **Edward Michael,** British soldier: b. County Westmeath, Ireland, 19 March 1778; d. near New Orleans, La., 8 Jan. 1815. He was a lieutenant in the British army in 1794 and served with distinction under his brother-in-law, the Duke of Wellington, in the Peninsular and French campaigns. He rose to the rank of major-general in 1812. In 1814, after the death of General Ross at Baltimore, he was appointed to the command of the British forces there. He led the expedition against New Orleans, where his forces were defeated by General Jackson and was killed in battle 8 Jan. 1815. See New Orleans, Battle of.

PAKHOI, päk-hoi', China, treaty port in the province of Kwang Tung, on the Gulf of Tong King, 275 miles south by west of Canton There are Chinese and European sections, the latter built on the top of a high bluff. There is an extensive export trade in anise oil, indigo, fish, hides, etc., and imports of cottons and woolens, opium and petroleum. Its history as a treaty port dates from 1876. In normal years the imports average about $13,000,000 in value, with exports aggregating about $700,000. Pop 20,000.

PALACIO VALDÉS, pạ-lă'thē-ō vạl'dās, **Armando**, Spanish novelist: b. Entralgo, Asturias, 4 Oct. 1853. He was educated at Oviedo and at Madrid, devoting especial attention to the studies of jurisprudence and political economy. His first literary efforts appeared in *La Revista Europea*, in the form of sparkling essays, which were so popular that the author became editor of the *Revista* in 1875. He directed the fortunes of this review until 1878, after which he confined his efforts to fiction. In 1881 he brought out 'El señorito Octavio,' which betrayed the author's powers of character analysis and delineation and also his descriptive powers. It was followed in 1883 by 'Marta y María,' the author's masterpiece, and a splendid portrayal of the struggle of a soul in choosing between a spiritual and contemplative life and an earthly love. Meanwhile several critical works had appeared from our author's pen, of which the chief are 'Los oradores del Ateneo' (1878); 'Los novelistas españoles' (1878); 'Nuevo viaje al Parnaso' and 'La literatura en 1831)' (1882). In 1884 Palacio Valdées published 'El Idilio de un enfermo,' which is a most interesting autobiography. 'José' appeared in 1885 and is one of the best tales in Spanish of those dealing with life on the sea. Other works appearing in rapid succession were 'Riverita' (1886); 'Maximina' (1887); 'La Hermana San Sulpicio' (1889); 'El quarto poder,' dealing with journalistic life (1888). In 1892 appeared 'La espuma' and 'La Fe,' which, although very popular abroad, were execrated in Spain, the former being construed as an attack on the aristocracy and the latter on the Catholic Church. Other works more after the author's early style followed, including 'El maestrante'; 'El origen del pensamiento'; 'Los Majos de Cádiz' (1896); 'La alegria del capitán Ribot' (1899); 'Tristán, ó el pesimismo' (1906). Consult Blanco-Garcia, 'La literatura española en el siglo XIX' (pt. II, 2d ed., Madrid 1903); Baxter, 'A Great Modern Spaniard (in *The Atlantic Monthly*, Boston 1900); Davidson's introduction to his translation of 'José' (ib. 1900); Howells, W. D. (in *Harper's Magazine*, New York 1886).

PALACKY, pā-lạts'kē, **Frantisek**, Bohemian philologist, critic and historian: b. Hodslavitz, Moravia, 14 June 1798; d. Prague, 26 May 1876. He studied philology and history at Presburg and Vienna, and in 1831 was appointed historiographer to the states of Bohemia. In the compilation of a general history of Bohemia, he searched libraries and archives in Bohemia and in Germany and Italy. In the political agitation of 1848 Palacky was the leader of the Slav or national party, as opposed to the German. His great work is his 'History of Bohemia' (in German and Bohemian, 5 vols., Prague, 1836-67). It has high repute for conscientiousness, thoroughness and accuracy. Among his many other works is one on the most ancient monuments of the Czech tongue, and in 1872 his 'Political Testament'; 'Geschichte des Hussitentums' (1868), and 'Geschichte des Hussitenkriegs' (1872-74). "Father Palacky," as he was fondly called, though himself a Protestant, was regarded by Roman Catholics generally with perfect confidence, even with veneration. He persistently but vainly opposed the reconstruction of Austria on a German-Hungarian basis, and in 1861 when he was elected into the Austrian House of Lords, he declined to attend.

PALÆOBOTANY. See PALEOBOTANY.

PALÆOGEOGRAPHY. See PALEOGEOGRAPHY.

PALÆOGRAPHY. See PALEOGRAPHY.

PALÆOLOGUS, a Byzantine family name which first became prominent about the middle of the 11th century, when a George Palæologus is reported as a prominent supporter of the Nicephorus Botaniates. The family reached the imperial throne in 1260 in the person of Michael VIII. This emperor successfully undertook many expeditions to Greece and the Archipelago, and used in vain his utmost endeavors to heal the schism between the Roman and Greek churches. His successor on the throne was his son, Andronicus II (reigned 1282-1328), under whose reign the Turks commenced in earnest a series of assaults on the Byzantine dominions. Andronicus attempted to oppose them with a force composed of mercenaries, but with small success, as these troops, with perfect impartiality, attacked both his enemies and his subjects. To pay them, he was compelled to levy such imposts as nearly destroyed Byzantine commerce. He associated his son, Michael IX, with himself in the government, and was dethroned by his grandson, Andronicus III (reigned 1328-41), an able warrior and wise ruler. He won several victories over the Bulgarians, the Tatars of the Golden Horde and the Serbians, and diminished the oppressive imposts of the previous reign. He failed, however, in his expeditions against the Catalans and the Turks made various forays extending even to the Balkans and Thrace. By his subjects he was affectionately called "Father of his Country." His son, John VI (reigned 1355-91), a weak and voluptuous prince, attempted in vain both by force and bribery to stop the progress of the Turks; at last the Pope, moved by his urgent entreaties, backed by a promise to submit the Greek Church to the Pope's supremacy, urged the Hungarians and Serbians to arm in defense of the Greek emperor, but the result was only an additional triumph to Sultan Amurath. The imbecile emperor was several times deposed, and, on his final reinstatement by the sultan, acknowledged himself as his vassal for the capital and a small tract along the Propontis and Black Sea. Indeed, so degraded had the Byzantines become, that they obeyed the Sultan Bajazet's summons to aid him in reducing Philadelphia, the last Greek stronghold in Asia Minor. His son, Andronicus IV (reigned 1355-73), who had been associated with him in the government, died in exile. Manuel II (reigned 1391-1425) pursued the same tactics as his father, John VI, and with the same result. The allied army of the Hungarians, Germans and French, which he had summoned to his aid against the Turks, was totally routed at Nicopolis by Bajazet, and Constantinople itself closely besieged. The invasion of Asia Minor by Timur, however, compelled the sultan to withdraw his whole force;

and his subsequent defeat and capture at Angora in 1402, and the contests among his sons for the supremacy, gave the Greek empire a breathing space. Having aided Mohammed I in his contests with his brothers, Manuel was, by the grateful sultan, presented with some districts in Greece, Thessalonica and on the Euxine. John VII (reigned 1425–49), was pressed by the Turks and urgently besought the Pope for aid from the West, promising to use his influence in bringing about a union of the Greek and Latin churches under the primacy of Peter. To this end he journeyed to the Council of Florence, where in July 1439, the union of the churches was agreed to. The agreement, however, was rendered null by the opposition of the clergy and people of the East. The Pope, however, saw that it was for his interest to fulfil his part of the agreement, and accordingly persuaded Wladislas of Hungary to lead his forces against the Turks, but this only hastened the downfall of the Palæologi. John's brother, Constantine XIII (reigned 1449–53), heroic scion of a degenerate race, accepted the crown, after much hesitation, knowing his total inability to withstand the Turks, and even then took the precaution of obtaining the sultan's consent before he exercised the imperial authority; but some rebellions in Caramania baffling Sultan Mohammed II's efforts to quell them, the emperor was willingly persuaded by his rash advisers that the time had now arrived for rendering himself independent of the Turks. The attempt brought swifter destruction on the wretched remnant of the Byzantine empire, for Mohammed invested the capital by sea and land, and after a siege, lasting from 6 April to 29 May 1453, Constantinople was taken by storm and the last of the Palæologi fell fighting bravely in the breach. A branch of the family ruled Montferrat, Italy, from 1306 to 1533. The Palæologi had married into the ruling houses of Hungary, Serbia and a niece of Constantine XIII married Ivan, Tsar of Russia. This marriage was advanced repeatedly by subsequent tsars of Russia as the basis of their claim to European Turkey. Consult Gibbon, Edward, ‹Decline and Fall of the Roman Empire,› edited by J. B. Bury (New York 1898–1900), and Pears, Edwin, ‹The Destruction of the Greek Empire› (ib. 1903).

PALÆONTOLOGY. See PALEONTOLOGY.

PALÆOZOIC. See PALEOZOIC.

PALÆPHATUS, Greek mythographer. The period in which he flourished is uncertain, but there are many references to him as the author of a large work dealing with the Greek myths for which he furnished explanations either historical or allegorical in character. Of this work there remains to us only a synopsis called ‹περὶ Ἀπίστων› (On Incredible Things), which for centuries was a favorite text in schools. For the text consult Westermann, ‹Μυθογράφοι› (Brunswick 1843), and Festa, N., ‹Mythographi Græci› (Vol. III, Leipzig 1902). Consult also Wipprecht, F., ‹Quæstiones Palæphateæ› (Leipzig 1892).

PALÆSTRA (Greek, «wrestling-school»), originally a school for the training of Greek youth in gymnastic exercises. At first private, such schools were afterward supported by the state, and in the most comprehensive sense a palæstra was a public place set apart, and under official direction, for exercises in wrestling and various forms of athletics. In these schools or gymnasiums special privileges were given to athletes training for contests in the public games. The name palæstra is also applied to wrestling and athletics themselves.

PALAFOX Y MELZI, pä'lą-fōн' ē mąl'thē, DON **José** de, dŏn hō-sā' dā, DUKE OF SARAGOSSA, Spanish patriot: b. Aragon, 1780; d. Paris, France, 16 Feb. 1847. When very young he was appointed an officer of the royal bodyguard and in that capacity accompanied Ferdinand VII to Bayonne in 1808. Palafox escaped the capture which befell his royal master and fled to Saragossa which he defended as captain-general of Aragon in two sieges in 1808–09, but was captured by the French and imprisoned (1809–13) at Vincennes. He then returned with the king to Spain, and was confirmed as captain-general of Aragon. Later he turned against Ferdinand VII and in 1833 joined the forces of Queen Isabella. He was created Duke of Saragossa in 1836.

PALAIHNIHAN, pą-līh'nĭ-hăn, or **PIT RIVER INDIANS,** an American family of Shastan stock comprising numerous tribes living in the northeastern part of California, in the basin of the Pit River, hence the local or common name of Pit River Indians (q.v.). Seven distinct tribes of these people were known in the days of 1849, but they are now almost extinct. They are of a low type of the American aborigines. Consult Dixon, R. B., in *American Anthropologist,* n. s., Vol. VII (Lancaster, Pa., 1905).

PALAIS DE JUSTICE, pä'lā dĕ zhūs'tēs, (French, palace of justice), a French courthouse, more specifically, the courthouse of Paris. Rouen also contains an edifice which is a remarkable example of the Flamboyant style of Gothic. See FRENCH ARCHITECTURE; PARIS; BRUSSELS.

PALAIS ROYAL, pä-lā rwä-yäl, a collection of buildings in the Rue Richelieu in Paris, composed of a palace, public gardens, shops, cafés and restaurants. The palace was built in 1634. (See PARIS). It was built for Cardinal Richelieu in 1629–36 by Lemercier. He bequeathed it to Louis XIII. It later became the residence of the Orléans Bourbons. Here Napoleon installed the Tribunate. At the Restoration it was repurchased by the Duke of Orléans. He formed the Cours de Nemours and built the Gallerie d'Orléans. At the Revolution of 1848 the Palais Royal was appropriated as the domain of the state and called the Palais National. On 23 May 1871, during the struggle between the army of Versailles and the Communists, it was set on fire. The left wing and part of the central pavilion were destroyed, but the galleries and the Théâtre Français were preserved. The destroyed wing has been rebuilt and other portions of the palace have also been restored. The Théâtre Français and the Théâtre du Palais Royal form part of the buildings.

PALAMEDES, păl-ą-mē'dēz, in Greek mythology, a hero, the son of Nauplius and Clymene. Although figuring prominently in the later accounts of the Trojan War, he is not referred to in the Homeric writings. Having discovered that the madness of Odysseus was only feigned, and having brought him to the leaders before Troy, Palamedes is said to have become an object of hate to that hero. Odysseus smuggled into the tent of Palamedes a letter from Priam and then had him stoned to death for treason. His father in turn shipwrecked the Greeks on the promontory of Caphareus by false lights. He is represented as skilled in learning, and his name is connected with the invention of letters, numbers, money, weights and measures, checkers, the lighthouse and dice.

PALAMON AND ARCITE, Theban princes, who both loved Emilia, sister of Hippolyta, and were imprisoned by Theseus. Boccaccio narrates their history in the 'Teseide,' which was used by Chaucer for 'The Knight's Tale.' In 1487 appeared Anne de Greville's poem in French, 'Palamon and Arcite,' and in 1634 Fletcher's 'Two Noble Kinsmen' dealt with the same theme. There were two plays, now lost, dealing with this story, one by Edwardes, produced for Elizabeth at Oxford in 1566, and one mentioned by Henslowe as performed in 1594. The story is also told by Dryden in 'Fables' (1700).

PALANAN, pä-lä'nän, Philippines, a pueblo of the province of Isabela, Luzon, on a river, five miles from the Pacific Coast, at the foot of the Sierra Madre Mountains, 36 miles east of Ilagan. A mountain trail begins at this point and Palanan is the trade centre for the surrounding region. It was here that Aguinaldo was located and captured. Pop. 1,140.

PALANDER AF VEGA, pä-län'dĕr äv vä'gą, **Adolf Arnold Louis,** Swedish naval officer and explorer: b. Karlskrona, 1842. In 1868 he was with the Nordenskjöbd expedition to Spitzbergen and was again a member of the expedition of 1872–73. In 1878–79 Palander was navigator of the *Vega* in the search for the Northeast Passage. He was awarded a pension by the Riksdag; was made aide-de-camp of Oscar II; created a knight and also made an admiral. He was Minister of State in 1901–05 and published an account of his search for the Northeast Passage.

PALANPUR, pä-lạn-poor', **PAHLANPUR,** or **PAHLUMPUR,** native state of India in the province of Gujarat, Bombay division, south of Rajputana. The state is crossed by the Rajputana-Malwa Railway, on which the town of Palanpur, capital of the district, is a junction for the British cantonment of Deesa. The native state has an area of 1,766 square miles and population of about 222,627. A political agency including this and other surrounding states contains 6,393 square miles and has a population of 467,691. The town, with a population of about 17,799, like the state and the agency, suffered terribly from plague, so that the population has decreased enormously.

PALANQUIN, păl-ạn-ēn, **PALANKEEN,** or **PALKI,** a vehicle commonly used in India and Oriental countries. It is a sort of litter or covered carriage, borne on the shoulders of four porters, eight of whom are attached to it and who relieve each other. It is usually provided with a bed and cushions, and a curtain, which can be dropped when the occupant is disposed to sleep.

PALATE, the roof and the superior aspect of the mouth or oral cavity toward its hinder or posterior portions. Anatomists are accustomed to speak of the hard and the soft palate. The former is constituted by the palate and superior maxillary bones; the latter is the more or less mobile prolongation of the hinder part of the roof or lining membrane of the mouth which is attached to the posterior border of the hard palate. The hard palate supports the tongue when that organ is employed in tasting, in the production of articulate sounds, in mastication and in swallowing. The membranes and tissues which cover the bones forming the hard palate are of thick conformation and are closely bound to the surface of the bones. The tissues are thinner toward the middle line of the palate or raphe. The palatine glands exist in a row on each side of the hard palate and are most numerous and of larger size as the hard palate is continued backward to form the soft palate. The mucous membrane of the hard palate is of a whitish color, this appearance being produced by a thick layer of epithelial cells covering the membrane.

The soft palate exists only in the crocodiles out of the class *Mammalia*. In the *Cetacea* it forms a muscular canal, which prolongs the hinder nostrils downward and backward, and is thus adapted to the breathing-process of these aquatic forms. In the ant-eaters the soft palate is nearly eight inches in length. It consists in all of mucous membrane and muscles and forms a semi-partition between the mouth and the hinder nostrils. In front it is attached to the hard palate. Behind it is free, and in the middle a pointed process, the uvula, is situated. This is found fully developed only in man and the apes. Its upper surface, or that next the nasal passages, is convex and is prolonged to form the floor of the nose. The lower or under surface is concave, so as to adapt it to receive the back of the tongue; and on this surface the soft palate bears a median ridge, showing the early stage of its formation, when it consists of two halves. Non-union of these halves and of those of the hard palate produce the deformity known as cleft palate. This is likely to interfere with nutrition in the child and with articulation, and may be complicated by harelip. It can and should be remedied by operation in early infancy. Mucous glands are abundantly distributed in the membrane forming the soft palate, these structures secreting the mucus which serves to lubricate the throat during the passage of food. Above these glands muscular tissue is found and the upper surface is formed of mucous membrane of the nasal passages already alluded to. The uvula, depending in the middle of the soft palate, gives to the latter the appearance of a divided or double arch. This structure, the uses of which are undetermined, consists of numerous mucous glands and a muscle known as the azygos uvulæ. The uvula varies in length in different subjects and at different times in the same person. Its permanent elongation gives rise to an irritant cough produced by its tickling the throat, and for the relief of this complaint its lower border is frequently excised.

In front the soft palate becomes continuous with the tongue and pharynx or back part of the mouth through two mucous and muscular folds on either side known as the anterior and posterior pillars of the fauces. The anterior arch of each side exists as a curve from the uvula to the side of the tongue. The posterior arch begins at the uvula, follows the free edge of the soft palate and ends at the side of the pharnyx. The pillars of each side separate or diverge in a triangular manner from their point of origin and within the triangle of each side a tonsil is contained.

The muscles of the soft palate number five pairs. These are the levatores palati, which raise the soft palate and bring it to the horizontal position in swallowing. The tensores palati draw the soft palate downward and tighten it, and their action also includes the keeping patent and open of the Eustachian tube. The palato-glossi and palato-pharyngei muscles form the bulk of the arches of the soft palate; and the azygos uvulæ muscle constitutes the last structure of this description included in the soft palate. The tonsils or amygdalæ («almond-like») are placed between the palatine arches. The substance of each tonsil contains numerous follicles, which open externally by 12 or 15 openings, and more deeply placed are masses of adenoid or lymphatic tissue similar to the Peyer's patches (q.v.) of the intestine. The tonsils are liable to hypertrophy and inflammatory affections, and are excised for disease without leaving any bad effects. Enlarged tonsils may obstruct the breathing and may produce deafness by occlusion of the Eustachian tube. (See TONSILITIS). Both the hard and soft palate are supplied with blood by the descending palatine branch of the internal maxillary artery, and with nerves by the palatine branches of the superior maxillary nerve. The use of the soft palate is chiefly to close the posterior nares or nostrils and so to prevent the escape of the food by the nose in swallowing; during which process the palate is elevated by the levator muscles from its usually dependent position to the horizontal position. In the latter position it lies upon the back of the pharnyx and so closes the nares. The arches of the palate assist in swallowing. The anterior arches during deglutition contract, so as to prevent the food from returning into the mouth; while the posterior arches contract at the sides and so preclude the escape of food into the nose. The whole process of swallowing is performed firstly by the mass of food being brought to the back of the tongue. The lower jaw being next closed to afford a fixed point for the action of the muscles which raise the larynx, the food is sent into the elevated pharynx by the pressure of the tongue on the palate. The posterior palatine arches and soft palate prevent the escape of the food into the nose at this stage; the anterior palatine arches and tongue prevent it returning to the mouth; the epiglottis is shut over the upper opening of the larynx so as to prevent the food entering the windpipe; and by the action of the constrictor muscles of the pharynx the food is finally shot into the œsophagus or gullet, along which tube it is propelled to the stomach by the peristaltic contraction of its muscular walls. See MOUTH; NOSE AND THROAT; PHARYNX; TONGUE.

PALATINATE, The, (1) a comprehensive term for two states of the German Empire, which, until 1620, were united. The name Palatinate (German, *Pfalz*) was originally given to the imperial castles dispersed over the German Empire, in which the emperors resided alternately, with a view to maintain order by their presence and to administer justice impartially in all the provinces of the empire. The palatine or count palatine was the highest civil and judicial officer in these castles. Finally, the title was retained by only two of the territorial magnates of the empire, whose states were distinguished as the Upper and Lower Palatinate, or as the Palatinates of Bavaria and the Rhine. The Upper Palatinate was included in the circle of Bavaria and was bounded north by the county of Baireuth, east by Bohemia, south by the county of Neuburg, west by Bavaria and the territory of Nuremberg. Its capital was Amberg. The Lower Palatinate (Palatinate of the Rhine) was contained in the electoral circle of the Rhine and was situated on both sides of the river. It was bounded by the territories of Mainz, Katzenellenbogen, Würtemberg, Baden, Alsace, Lorraine and Trèves. It was composed of the Palatinate proper or Electoral Palatinate on the right bank of the Rhine, one of the most fertile countries in Europe, and of the principality of Simmern, the duchy of Deux-Ponts (Zweibrücken), the half of the county of Spannheim and the principalities of Veldenz and Lautern. The counts-palatine of the Rhine, whose original seat was Aix-la-Chapelle, in the 11th century were already in possession of the office and of the lands pertaining to it, and were among the most powerful princes of the German Empire. In 1227 the entire Palatinate fell into the possession of the house of Bavaria and underwent a series of successions until 1619 when Frederick V, of the Simmern line, who had succeeded in 1610, was put to the ban of the empire for aspiring to the crown of Bohemia. (See GERMANY; THIRTY YEARS' WAR). His electorate and estates were given in 1623 to Maximilian, Duke of Bavaria. Charles Louis, son of Frederick V, recovered the Lower Palatinate by the Peace of Westphalia (1648), and a new electorate, the eighth, was created for him, with the office of high-treasurer. The Upper Palatinate and the former rank of the elector-palatine in the electoral college remained with Bavaria. In 1742 the electorate fell to the Sulzbach line, represented by Karl Theodor, and in 1777 he succeeded to the electorate of Bavaria, a portion of the estates of which, however, fell to Austria. This was accompanied by the recovery of the old electoral office of the Palatinate and the transference of the grand-treasurership to Brunswick. Toward the close of his reign the Palatinate was conquered by the French. He died without issue in 1799 and was succeeded by Maximilian Joseph, Duke of Zweibrücken. At the Peace of Lunéville (1801) he was compelled to surrender the Palatinate. The possessions on the left bank of the Rhine were annexed to France, a considerable part of the remainder was given to the Grand-Duke of Baden and the rest was distributed among other princes. At the Peace of 1814 the German states recovered their possessions on the left bank of the Rhine and the Palatinate was redistributed among Bavaria, Baden, Hesse-Darmstadt and Prussia. The portion belonging to Baden is included in the circles of Mannheim, Heidelberg and Mosbach; the Darmstadt portion constitutes the provinces of Starkenburg and Rheinhessen. Bavaria received the whole of the Upper Palatinate and the portion of the Lower Palatinate forming the Bavarian circle of Rheinpfalz. The Prussian portion was added to the Prussian province of Rheinland. The area of the Rhenish Palatinate is 2,372 square miles (pop. 937,085); of the Upper Palatinate, together with Regensburg, which is joined to it into one province, is 3,862 square miles (pop. 1,600,284). Speyer is the capital of the Rhenish Palatinate, Regensburg that of the Upper Palatinate. The population of Speyer is about 23,000. Consult Nebenius, 'Geschichte der Pfalz' (Heidelberg 1874).

(2) The term palatinate or county palatine came into use in England during the 13th century, the counts or earls-palatine ruling over entire counties, acting as independent princes, exacting feudal rights and contributions and simply swearing homage and fealty to the king. The principal counties palatine were Lancaster, Chester and Durham. In the colonial days of the United States Maryland was granted to the Baltimore family as a county palatine on the model of Durham.

PALATINE ANTHOLOGY, a Greek anthology compiled in the 10th century by Constantine Cephalas. For several centuries it was lost but in 1606 Salmasius found it in the Palatine Library, Heidelberg. It was first published in Brunck's 'Analecta' (1776). Consult Thackeray, 'Anthologia Græca' (London 1877).

PALATINE HILL (Lat. *Palatium,* later *Mons Palatinus*), the most central, the earliest settled and (save for the Capitoline) the most famous and important of the seven hills of Rome. About 130 feet above the Tiber and 36 more above the sea-level, the hill is an irregular quadrilateral and to this shape is due the name of the *Roma quadrata,* the primitive city which the legend attributes to Romulus. The name Palatium, which the Romans connected with the Arcadian city Pallantium, is probably related with Pales, an Italian rural divinity. On the Palatine the Lupercalia was celebrated in honor of Romulus; there were the ancient temples (of Victory, Jupiter Stator and the Magna Mater) in the days of the early republic, the residences of Cicero, Marcus Scaurus and others in the last period of the republic and at the beginning of the principate Augustus' own home (to which fact the use of the word «palace» from the *Palatium* is due), the temple of Apollo dedicated in 28 B.C. and the Latin and Greek library. Tiberius and Caligula built additions to Augustus' palace; the latter emperor bridged the Capitoline to the Palatine. The Palatine was no longer used as an imperial residence after the time of Alexander Severus and there was no more splendid building there until Pope Paul III built the villa called Orti Farnesiani. Excavations of the hill began in 1762 under Bianchi's superintendence and was renewed a century later by Rosa at the expense of Napoleon III. The Italian government purchased the Farnese Gardens in 1871 and now has charge of excavations.

PALATKA, pạ-lăt'kạ, Fla., city, county-seat of Putnam County, on the Saint John's River, and on the Florida East Coast, the Florida Southern, the Georgia Southern and Florida and the Jacksonville Atlantic Coast Line railroads, 47 miles in direct line south of Jacksonville. It is the centre of a prosperous agricultural and fruit region, is in daily steamer communication with Jacksonville and exports large quantities of oranges, sugar, cotton and cypress lumber. It is also popular as a winter resort. It is the seat of the Putnam County High School and of the Saint Joseph's Academy and Day School (Roman Catholic). Pop. 3,779.

PALAWAN, pä-lä'wän, Philippines, the most southwestern island of the archipelago, lying west of Mindoro, Panay and Negros; it is bounded on the west by the China Sea, which it separates from the Sulu or Mindoro Sea; area, 4,027 square miles; with dependent islands, 5,238 square miles. It is one of the largest islands of the Philippines, and from its geographical position one of the most important, as it lies in the trade route between India and China and Manila.

Topography and Climate.— The island is long and narrow in shape; the greatest length from northeast to southwest is 278 miles, and the width averages only 17 miles, and is nowhere more than 30 miles, being only 4½ miles in the centre. The coast is indented with numerous sounds, gulfs and bays, most important among them Malampaya Sound (q.v.). A mountain system which divides Palawan into two watersheds extends the length of the island following the general direction of the coast; the highest summit of this system is Mantaliñgajan in the south (6,843 feet); the average height is from 2,500 to 3,000 feet; between the summits are high table-lands. There are a number of rivers, which are all short; in the northern part there is a lake which opens into the ocean by a subterranean river. The climatology of the island shows two seasons, the southwest monsoon or wet season and the northeast monsoon or dry season; the heat is not extreme; malarial fevers are common on some parts of the coast. Earthquakes are relatively rare.

Forests and Fauna.— The mountains are very heavily wooded, the forests contain valuable building, dye and medicinal woods, including ebony, sandal, logwood, bamboo, ipil (a very hard wood), apiay, camphor, gum mastic, molave; a number of the trees found in Palawan exist nowhere else in the Philippines. Dammar, a gum which exudes from a large tree, is found in many places in deposits in the earth, which have, however, never been fully worked. The nipa palm grows luxuriantly along the rivers, and rattan is an important article of export. There are also numerous plants of varied character, including orchids and pitcher plants; among the latter is a traling variety, the pitchers of which will hold a pint and a half of water.

The wild animals of Palawan are not very numerous; there are several varieties of the monkeys, also the pakdá or big ape, and porcupines; the birds are mostly of unusual species. Reptiles are abundant; alligators are commonly found in the lakes and swamps, and the pythons are unusually large, specimens over 22 feet long having been found.

Industrial Resources.—The resources of the island are as yet poorly developed. The chief industry is the raising of cattle, hogs and goats; goats and fowls are bartered with the ships along the coast. Rice, tobacco, nutmegs, sweet potatoes and other food products are raised for home consumption, and there are a few primitive manufactures also for domestic use. Edible birds' nests are found in large numbers in the rocky caverns of the coasts; they are of excellent quality, being considered second only to those of Peñon de Coron (q.v.), and have brought twice their weight in silver in the Chinese market. Honey and wax are also collected and brought to the coast for trade. There are no roads, except a few portages, but a number of trails; the rivers also afford means of transportation near the coast. Only the coast is suitable for agriculture.

People and History.— Next to the Visayans, the dominating race of the northern and central parts of the island are the Tagbanuas (q.v.), a peaceful and docile race of mixed Malay and Negrito blood. The Moros predominate in the southern part, south of the 10th parallel of latitude. Previous to the 18th century Palawan was a part of the sultanate of Borneo; in the early part of that century, the Spaniards established several garrisons in the northern part of the island for the purpose of protecting their dominions on the north from the Moro pirates, and the island was soon afterward ceded to Spain. In 1885 a special attempt was made by the Spanish government to colonize Palawan by offering settlers free transportation and other privileges, but this failed. An attempt to establish a convict settlement was also unsuccessful, and Spanish authority was recognized only along the coast. The United States troops occupied Palawan in the early part of 1902, and in June of that year civil government was established in that part of the island lying north of the 10th parallel of latitude. This region with its dependent islands is known as the province of Paragua. Its capital is on the island of Cuyo. The part south of this parallel, known as the country of the Moros, is as yet without civil government. The most important town of Moro Palawan is Puerto Princessa, which has not 2,000 inhabitants. The island of Balábac, lying south of Palawan, is governed in accordance with the terms of the treaty with the Sultan of Sulu. At Iwahig near Puerto Princessa there is a modern penal colony on liberal lines. On the small island of Culian there is a leper colony. Population of the island about 35,000.

PALAWAN PASSAGE, the route through the Balábac Strait and along the east coast of Palawan, used by vessels in the trade between China and Manila during the latter part of the southwest monsoons, because more sheltered than the China Sea route to the west of Palawan. This route was first explored in 1850 by Captain Bates of the British navy, and soon afterward generally adopted.

PALAY, a tropical African climbing plant (*Cryptostegia grandiflora*) of the milkweed family. Its stalk-fibres, which are strong and white, are spun into a very fine yarn; and its milky juice forms a kind of caoutchouc. It is used for this latter purpose in Burma.

PALAZZO PITTI, pä-lät'sō pĭt'tē, a palace in Florence. See Florence.

PALE, *in heraldry,* a figure of the group known as ordinaries, consisting of a broad perpendicular band in the middle of the shield. Several charges of any kind are said to be «in pale» when they stand over each other perpendicularly, as do the three lions of England. A shield divided through the middle by a perpendicular line is said to be «parted per pale.» When divided into an even number of parts by perpendicular lines, it is «paly of» so many pieces.

PALE, The English, Ireland, a name applied in the 14th century to that part of Ireland which was completely under English rule, to distinguish it from the parts where the old Irish laws and customs prevailed. It varied in extent at different periods, consisting of Dublin and more or less of the neighboring country.

PALE OF SETTLEMENT, that part of Russia within which Jews are allowed to reside. The Pale was established in 1791 to prevent the Jews of White Russia, who came under Russian dominion in 1772, at the first partition of Poland, from spreading throughout Russia. Its boundaries have varied from time to time; in 1904 it contained the governments of Bessarabia, Vilna, Vitebsk, Volhynia, Grodino, Yokaterinoslav, Kovno, Minsk, Moghilef, Podolia, Poltava, Taurida, Kherson, Chernigov and Kiev. Within these governments the Jews were not in general permitted to settle outside the cities and towns. They were allowed to live in Poland also, but this was not considered as part of the pale. Under certain narrow restrictions, they were also permitted to live in Courland, the Caucusus and Turkestan. They were entirely excluded from Finland, and except in the case of convicts and their children, from Siberia. In Moscow, too, they were subject to particularly narrow restrictions. In 1903 the restrictions on the Jews were somewhat mollified. In 1904 the pale of settlement might be left by merchants of the first guild and their families, persons possessed of a higher education, those who had completed the military service before 1874 and skilled artisans. The same classes were permitted to reside in villages. Unrestricted rights of residence were accorded to veterans of the Japanese War, manufacturers and counsellors of commerce. Restriction to the pale has been abolished by the Russian revolutionaries in 1917 along with all other religious and racial disabilities.

PALEA, plural **PALEÆ,** the bracts, usually membranous and colorless, on the receptacle of a composite plant between the florets; the chaff. Also the bracts immediately surrounding the fertile leaves organs in grasses. See Bract; Flower.

PALEARIO, pä-lā-ä'rē-ō, **Antonio,** more correctly, Antonio dei Pagliarici, and according to his Latinized title Aonius Palearius, Italian religious innovator: b. Veroli, Roman Campagna, 1500; d. Rome, 1570. He was a teacher of rhetoric at Perosa, Siena, Padua, Lucca and Milan, whose reputation had spread over all Italy and abroad. He made his home especially at Siena, and in 1567 was brought before the Holy Inquisition at Rome, and three years later suffered martyrdom at the stake. His principal work is a long Latin didactic poem, 'De Immortalitate Animarum.' Famous as his poetic and theological writings were, equally popular was the work attributed to him, 'Del Beneficio de Giesú Christo Crocifisso' (1548), which was translated into several languages, but in 1549 was suppressed by the Inquisition. It was published at Cambridge, England (1853), and at Leipzig with a German translation by Tischendorf (1856). Ranke maintained it to be the work of a Benedictine monk, Benedetto of Mantua. Consult Young, 'Life and Times of Antonio Paleario' (London 1860); Bonnet, 'Aonio Palerio' (Paris 1863).

PALEMBANG, pā-lĕm-bäng′, Sumatra, Dutch residency in the southeastern part of the island; also the capital city of the residency. The country is drained by the Musi (or Moesi) River, along the banks of which there are valuable supplies of petroleum. An alluvial plain and plentifully watered, it is very fertile. Its native inhabitants are Moslem Malays, except a race called Orang-Kubu, living by the chase in the thickest jungles and exhibiting a very primitive culture. Palembang residency has an area of 53,497 square miles and a population of about 700,000, of whom 373 are Europeans, 1,876 Arabs and 6,451 Chinese.

Its capital city of the same name lies on both banks of the Musi, 80 miles from its mouth, in a swampy region, the houses being sometimes built in the very stream. The old Javanese name for the city seems to have been Malayo, so that it may be the Malajour of Marco Polo and the Mo-lŏu-yu of the Chinese geographers. An attempt has been made to prove that the town was once held by Hindus, an occupation like that in Java. The main building is an 18th century mosque. Coffee and pepper are exported; and there is some trade in silks, carvings and goldsmiths' wares. The Dutch built a factory here in 1618, but the country remained independent until 1812 when it was occupied by the English. It passed to the Dutch after 1825. Pop. over 60,000.

PALENQUE, pạ-lĕn′kā, the most individual and distinctively interesting of the ruined cities belonging to the pre-Columbian civilization of America.

Palenque lies in the foot-hills, on both sides of the mountain stream Otolum, or Otula (the Place of Falling Stones). It is some six miles from Santo Domingo del Palenque, Chiapas. Owing to the dense tropical vegetation which abounds in this district the ruins have been but very imperfectly explored. But enough has been ascertained concerning them to fix their character undoubtedly as a very important pre-Columbian religious centre. The absence of fortifications of any kind and the open character of the buildings together with their peculiar structure would seem to indicate this; and the mythological scenes depicted in the stucco work within several of the edifices confirm this opinion.

Owing to its peculiar character, its one-time undoubted importance, its proximity to other places visited by the Spaniards shortly after the Conquest and the fact that it is mentioned in none of the accounts or reports of this period, would seem to indicate that Palenque was a deserted city previous to the discovery of Yucatan and Mexico. Up to the time the ruins were discovered in 1746 and officially brought to the attention of the Spanish government, apparently their existence had not been known except to the aboriginal inhabitants of the surrounding district. But commencing shortly thereafter and continuing down to the present time, numerous partial examinations and explorations of the ruins, official and private, have been made; yet not enough of a sufficiently-extended character has been done to definitely settle the relationship of Palenque to the other civilizations by which it was surrounded, either at the time of its foundation or subsequent growth to power and influence.

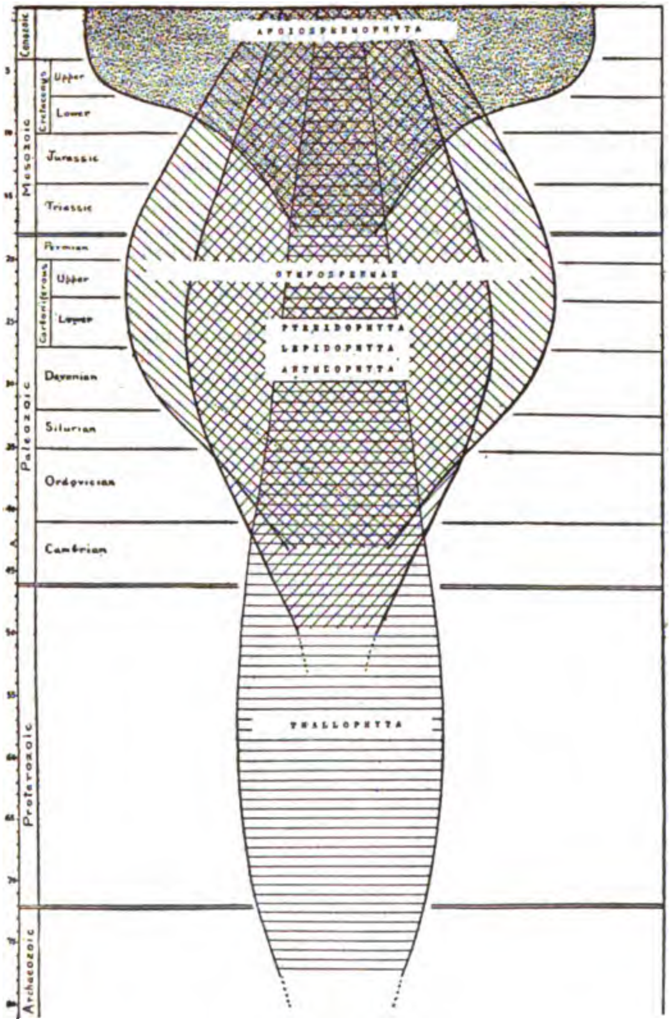
Many of the original buildings of Palenque must have disappeared; in fact, Calderón, one of the first to describe the city says that he counted 206 buildings, most of them more or less in ruins. Of these the most distinctive and important is the edifice known as the «Palace.» This stands upon a pyramid some 60 feet high, which rises from a narrow plain on the left bank of the river. Up the eastern side of the pyramid, which is 263 by 310 feet square, runs a broad stairway centrally placed. There was probably a similar one on the north. The sides of the pyramid were originally faced with blocks of cut stone, but these are now displaced and many of them thrown down by the excessive growth of tropical vegetation. This was the more easily effected since the mass of the pyramid is composed of earth and loose stones. The «Palace» crowning the pyramid is 240 feet long and 180 wide. It is surrounded by a narrow passageway formed by the summit of the pyramid. The Palace has over 40 doors, 9 feet wide and 8½ high, facing outward on to this passageway. These lead, on the north and east, into one long corridor-like apartment running along both these sides and 60 feet around the south end and 40 feet around the west side, a total distance of over 500 feet, without an intervening wall or obstruction of any kind. On the west, the whole length of the corridor contains only two divisions, while on the south there are five, two of which are pierced by connecting doors. Within this great corridor runs a second corridor of like width facing on an immense patio or courtyard. Half of this corridor is taken up with one long room running round the north and east sides. Many doors open from this latter corridor into the courtyard, which is divided into four nearly equal parts or smaller courts. In these courts are subsidiary buildings, one of which contains seven rooms, one quite large. From the patio rises a great tower 30 feet square at the base, and standing 60 feet above the level of the court, in five sections consisting of the base proper and four stories. It is probable that the 100 or more doors of the palace were covered with curtains which would have been sufficient protection in a tropical climate. In the rooms of the building, on the stairways and outer walls is a luxuriant display of excellent stucco and bas-reliefs showing well-executed human figures and stucco tablets. The edifice is plastered throughout. Numerous stone stairways connect the corridors and the rooms with the courts. Underneath the «Palace» and within the pyramid are numerous rooms, all of which so far as explored are plastered. They are apparently the same in form as the upper rooms and connected with them by stairways. They are said to have once contained decorated tablets; but if so the dampness has destroyed them. A similar building in form and position to the «Palace» is the «Temple of the Three Tablets.» The incline side of the pyramid from which it rises is 110 feet on the sloping side. The Temple itself is 76 feet long, 25 feet wide and 35 high. In the façade are five wide doors; on the walls between are well-executed bas-reliefs in stucco and on the corner front walls are columns of hieroglyphics. One long room takes up the front of the building and from this three doors lead each into a back room. Here are two large stone tablets and nearly 400 sculptured hieroglyphics, which are supposed to have been used either for educational purposes or for the administration of the law. «The Temple of the Beau Relief» contains a life-sized figure sitting on a throne terminating on the right and the left in finely executed tiger's heads. The whole, which is in stucco, is one of the best pieces of native modeling found in America. The building is also situated on a pyramid and is 20 feet square by 25 feet high. Another noted building in Palenque is the Temple of the Cross, not so much on account of the edifice itself as through the famous «Palenque Cross» that once stood within its shrine. It stands upon a stone-faced pyramid which measures 134 feet up the sloping side. The Temple is 50 feet long, 31 feet wide and 40 high. It has three wide doors in the façade, and between them tablets in stucco and other skilful decorations. The space between the outer doors and the corners are covered with hieroglyphics; and the sloping roof with artistic stucco decorations. On the roof is a two-story structure 35 by 30 feet and 16 feet high, also decorated in elaborate stucco. The Temple consists of an outer room from which doors lead into three rooms at the back. In the centre or larger of these rooms on the rear wall was the tablet of the cross, or rather the three tablets of the cross, which are now in the National Museum in Mexico City. (See CROSS OF PALENQUE). The Temple of the Sun, which stands on a twin pyramid almost as high as that of the Temple of the Cross, is similar to the latter in form and plan. It is still more remarkable than the other buildings for its variety of fine stucco work and ornamentation. It has the same disposition of stucco work and hieroglyphics on the façade, which is 38 feet long, the depth of the building being 28 feet. On the rear wall of the inner sanctury is the tablet of the Sun consisting of three slabs, the centre of which contained the main subject, the offering to the sun, and the other two, like those of the cross, are covered with explanatory hieroglyphics. The space covered by the tablets is 8 by 9 feet. Near here is an aqueduct of stone 217 feet long. But it was at one time evidently longer. North of the palace are the foundations, mounds and other remains of 11 buildings; and on a hill to the east is another foundation and around it other ruins. At least two ancient bridges exist north of the Palace, one of which is 56 feet long by 42 wide and built of large hewn blocks of stone; while another lies some distance west. Some way south, in the tropical forest, are two other pyramids of considerable height, while in every direction are still the evidences of a once populous centre. Consult Bancroft, H. H., 'The Native Races of the Pacific States' (5 vols., San Francisco 1883); Bandelier, A. F. A., 'Report on an Archæological Tour, in Mexico 1881' (Cambridge 1885); Charney, Desiré, 'Ancient Cities of the New World' (New York 1887); Holmes, W. H., 'Ancient Cities of Mexico' (Chicago 1895); Morgan, L. H., 'Houses and House Life of the American Aborigines' (Washington 1881); Mandslay, Sir Alfred, 'Biologia Centrali Americana: Archæology' (London 1897); Peñafiel, Antonio, 'Monumentos del arte mexicano antiguo' (Berlin 1890); Spence, 'The Myths of Mexico and Peru' (1913); Stephens, J. L., 'Incidents of Travel in Central America, Chiapas and Yucatan' (17th ed., 2 vols., New York 1867–71).

PALEOBOTANY. The science of the extinct plants and plant assemblages of the globe. That branch of paleontological science dealing with the endless succession of plants which have inhabited the earth since life first came into existence. Its story is the history of vegetations and their interactions with complex and ever-changing environments through eons of time that resulted in populating the earth's surface with a succession of floras and finally in the production of the relatively modern and highly specialized races of flowering plants. Its aim is not the mere assembling of facts, but the understanding and interpretation of these facts in their relation to the evolution of individuals and communities and earth history.

History.— Despite the great abundance of fossil plants in the countries of the classical world surrounding the Mediterranean, the limestone quarries of the Greeks, the petrified forests of Nubia and the vast public works of Imperial Rome, none of the writers of antiquity mention fossil plants, although some of them carried on a lively discussion regarding the nature of animal fossils. Petrified wood is not recorded until about the middle of the 13th century (Albertus Magnus) and fossil foliage not before the latter half of the 17th century (Major Lhwyd). The earlier commentators explained fossils as due to the mystical action of the stars or the mysterious working of spiritual forces like the *vis lapidifica* of Avicennia or the *virtus formativa* of Albertus Magnus or the stone-making spirit of Sperling. Nothing was farther from the accepted thought than that fossils were the remains of real organisms that once lived, the nearest approach to such a view being that they were some of the models used by the creator, or that they had developed from abortive germs of animals and plants that had become lost in the earth. After the view that fossils were the remains of organisms had gained many adherents they were regarded as evidence of the universal deluge — an interpretation suggested by Martin Luther in 1539. This flood theory or diluvial hypothesis found numerous advocates throughout the 17th and even far into the 18th century. For example, in the 'Transactions' of the Royal Society for 1757 James Parsons figures numerous fossil fruits from the early Eocene deposits of Sheppey in the Thames estuary. These he thought would furnish evidence of the season of the year in which Noah and the rest of creation were obliged to take refuge in the ark, and he concludes from the maturity of these fossil fruits that the deluge commenced in the fall of the year and not in the spring as his contemporary Dr. Woodward had supposed. Johann Jacob Scheuchzer (1672–1733) was the great exponent of the flood theory, publishing his *Herbarium Diluvianum* at Zürich in 1709, and even figuring the bones of one of Noah's less fortunate brethren which he found among the fossil leaves at Ocningen and which subsequently proved to be the bones of a large Miocene amphibian. The flood theory passed through various phases of opinion. At first the fossil plants were regarded as similar to those still growing in the vicinity — a natural enough belief when the universal acceptance of the Mosaic cosmology and a world but 6,000 years old is borne in mind. Subsequently when the differences in the fossils became apparent they were thought to represent forms still existing in the tropics that had been swept to Europe and buried by the waters of the flood. When with the progress of knowledge of tropical plants this last view became untenable it was thought that the fossils represented plants that had been exterminated by the flood, and from this it was but a slight step to the opinion advocated by Volkmann, which appealed to many, that the antediluvian vegetation was of a far higher order than that of the present, with none of the thistles or other weeds of modern times, and that our modern forest trees are the degenerate descendants of delightful Adamitic fruit trees — a phytological fall paralleling and ascribed to the fall of man. Gradually it came to be recognized that fossil plants were not only unlike recent ones, but that they were very ancient and not merely antediluvian, but pre-Adamitic, a view first advocated by Blumenbach (1790). The first year of the 19th century saw the publication of the 'Beiträge zur Flora der Vorwelt' by Ernst Friedrich von Schlotheim (1764–1832) in which 14 plates of fossil plants were published and these plants were segregated into 5 classes and 12 orders based upon the method of preservation. The next work of importance with a somewhat different point of view, as its title indicates, was the 'Versuch einer geognostisch-botanischen Darstellung der Flora der Vorwelt,' published in parts from 1820–38 by Kaspar Maria von Sternberg (1761–1838). The vegetation of the world was divided into three periods — an older insular period characterized by the coal plants; a period marked by cycadean types, which corresponds roughly with the modern Mesozoic, and a period introduced by fucoidal remains and characterized by dicotyledonous leaves, which corresponds with the modern Cenozoic. The real nestor of paleobotany, however, was Adolphe Theodore Brongniart (1801–76), son of Alexandre who was associated with Cuvier in his great work on the Paris Basin. Brongniart commenced publishing on fossil plants at the early age of 21 and in 1828 in his *Prodrome* to the 'Histoire des végétaux fossiles' he drops the prevailing point of view and treats fossil plants as none the less plants, endeavoring to fit them into the natural system of classification of Jussieu, and recognizing the true position of the gymnosperms a generation or more before the students of the modern conifers arrived at the same point of view. Brongniart maintained that there had been a steady progress from lower to higher forms. He believed in a gradually ameliorating climate, and divided the vegetation into four periods, the first extending from the beginning to the end of the Carboniferous, the second corresponding to the early Triassic (grés bigarre), the third including the later Triassic, the Jurassic and Cretaceous, and the fourth making up the Tertiary and Quaternary or Cenozoic. He thus laid the foundations of the science in a broad way and was the inspiration of numerous students who grew to productivity under his tutelage and example. During the remainder of the 19th century a vast body of literature was built up by an ever-increasing number of students of whom the most illustrious were H. R. Goeppert (1800–84) of Silesia, Franz Unger (1800–70) of Styria, Oswald Heer (1809–83) of Switzerland, Gaston de Saporta (1823–95) of France and C. von Ettingshausen (1826–97) of Austria. In Britain W. C. Williamson (1816–95), following the pioneer work of Witham (1833) and Binney (1868), succeeded in placing the anatomical study of petrified plants of the Carboniferous on a solid foundation, and this phase of activity is still assiduously cultivated by a considerable number of contemporary British botanists, among whom D. H. Scott unquestionably stands at the head. In France the most active contributors in recent years have been Bernard Renault (1836–1904) to the anatomical side and C. Rene Zeiller (1847–1916) to all phases of the subject. Probably the most capable of contemporary paleobotanists is A. G. Nathorst of Stockholm.

The pioneer workers in North America were J. W. Dawson (1820–99) in Canada, and Leo Lesquereux (1806–89) and J. S. Newberry (1822–92) in the United States. Unger in his 'Genera et Species Plantarum Fossilium' had essayed a complete manual of the subject as early as 1850, but a sufficiently large body of facts had not yet been accumulated to give his work lasting value, although it was of immense importance at that time. This task was accomplished by W. P. Schimper (1808–80) in three volumes of text and one of plates of the 'Traité de paléontologie végétalé' (1869–74). A less usable work covering the same field in a different way was the 'Paleophytologie' contributed by Schimper and Schenk to Zittel's 'Handbuch der Paläontologie' which was completed in 1890. More recently A. C. Seward has essayed to cover the field in a four-volume work on fossil plants (1898–1918) in which little space is devoted to other than the morphological aspects of the subject and in which the flowering plants are entirely omitted. Other of the more important treatises on paleobotany are listed in the bibliography at the end of the article.

Methods of Preservation.— Fossil plants have been preserved by two principal methods. They either became water-logged and buried in sediment ranging from mud to sand, or were infiltered by some mineral solution or were replaced molecularly by silicic acid, calcium carbonate or other mineral substance. The first method is called inclusion and the degree with which the details are preserved in the resulting impression depends on the fineness of grain of the sediment. Very fine muds preserve every detail with great fidelity. Therefore shales, which are simply lithified muds, furnish beautiful fossils, as in the roofing shales that overlie so many coal seams. The redeposition of calcium carbonate in the form of travertine often entombs well-preserved plant remains as do the alluvial muds of river flood plains. Volcanic dust falling in water forms an admirable matrix. Impressions of plants constitute the bulk of the objects with which the paleobotanist has to deal. The substance of the enclosed plant fragment may remain as a carbonaceous film, it may be replaced by salts of iron or other mineral or it may be entirely dissipated, leaving merely the impression. Occasionally lignified remains such as those from certain localities in the Upper Cretaceous may retain their internal structure more or less intact and by special methods may be sectioned and studied microscopically. The fireclays of the coal measures often furnish beautiful impressions in dark tints on a light drab background, and some of the light-colored clays of the Upper Cretaceous of South Carolina, where the leaf substance has been replaced by iron oxide, yield handsome red impressions. Plant remains are often found in a good state of preservation in nodules of iron or calcium carbonate. Coal or lignite beds are simply examples of the inclusion of vegetable débris *en masse*. In course sediments, or occasionally in finer materials such as tuffs or travertine, more resistant objects like seeds or stem fragments have left nothing but the cavity or cast, and such objects often furnish satisfactory subjects for study. Amber or other fossil resin has also frequently preserved mummies of plants or other organic remains, especially delicate objects like flowers. The cuticularized integument of pollen grains or spores is very resistant and is frequently preserved. Similarly the cuticles of leaves retaining the outlines of the epidermal cells and the stomata are often found to be intact after the remaining tissues have become completely disorganized. These can sometimes be peeled from the fossils and mounted for microscopical examination or if this is impossible colloidan casts of the surface can be made and by the proper handling of the illumination yield satisfactory microscopic details. The second and third methods of preservation, or more generally a combination of infiltration and replacement, are usually termed petrifaction. The internal structure of the plant material is conserved with more or less perfection according to the rapidity of permeation before the tissues rotted and the completeness with which replacement took place. If this happened before the tissues became disorganized thin sections may be ground and the histology elucidated. Petrified woods, especially of coniferous trees, either silicified, calcified or ferruginized, are common at many geological horizons. More delicate plant fragments are only rarely preserved in this way. Such remains, where the replacement has been by calcium carbonate, characterize certain horizons of the English Coal Measures, and similar "coal balls" have been discovered more recently in Moravia, Westphalia and Russia. Silicified plant fossils are found at certain horizons in the Permian of Saint Étienne and Autun in France and often the most delicate thin-walled tissue such as cambium and phlœm is well preserved. The stumps of Cycadeoidea from the American Lower Cretaceous are silicified, usually denoting a burial in sandy deposits, and range in perfection from those of the Lower Cretaceous of Maryland which are little more than sandstone casts to some of the wonderfully preserved stumps of the Black Hills



[*Courtesy of Johns Hopkins University*]

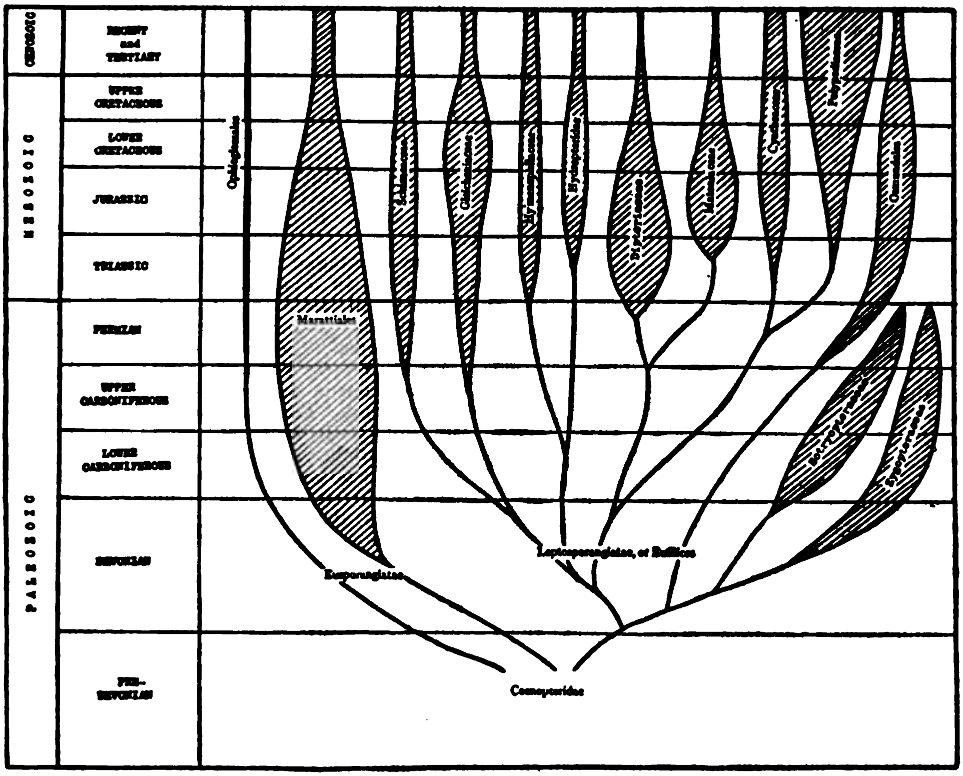
FIG. 1.—Diagram Showing the Geological History and Increasing Complexity of the Vegetable Kingdom.

and Wyoming in which even the embryos in the ovules are completely preserved.

General Principles.— The general principles which paleobotany has elucidated or illustrated can be but briefly indicated. First among these is the fact, roughly traced in the subsequent discussion, that the history of plants shows a gradual transformation from early simplicity to later complexity and a progressive differentiation of both structures and habits in the successively higher groups, thus exemplifying the universal principle of evolution. The original scene of plant activity was in the water. Gradually the main theatre of operations was transferred to the land and the distinction between vascular and cellular plants in this respect is analogous to the distinction between vertebrate and invertebrate animals. Each successive group of plants that appeared upon the scene illustrates a second great principle — that of adaptive radiation. That is, by progressive modifications (the mutations of Waagen) groups became dominant, as, for example, the Lepidophytes, Arthrophytes and Pteridosperms of the Carboniferous or the Cycadophytes of the Mesozoic or the Angiosperms of the Cenozoic; their members became adapted for a great variety of environments and tended to occupy all of the available situations on the land or in some cases became secondarily adapted for an aquatic existence, like the water ferns or the various aquatic angiosperms. Paleobotany shows one group after another thus dominating, becoming specialized during the process and then waning or becoming entirely extinct. The accompanying diagram illustrates the successive dominance of different plant types and the increasing complexity of the vegetable kingdom as a whole. (Fig. 1). Another principle is illustrated by the progressive loss of plasticity as organisms or organs became complex and specialized. It was the simpler organisms that outlasted the complex or gave origin to new types. The more complex lost their power of adaptability to change and readily succumbed when such changes in their environment came. For example, it was not the complex arborescent lepidodendroids that gave rise to the modern club mosses, nor were the lofty calamites the progenitors of the modern mares tails, but in each case simpler forms saved the phylum from extinction. Fern synangia may have given rise to seeds by modification and peripheral sterilization, but no seed has or ever will become modified into a synangium. Thus evolution either of organs or organisms is non-reversible. The earlier forms of the successive plant groups, in accordance with the a priori conclusions of evolutionary philosophy, are in general synthetic or generalized in structure, i.e., they combine features of various categories that subsequently became characteristic of diverging lines of evolution. Thus all of the earlier plants had motile sperms, none had true vessels such as characterize the wood of angiosperms, cryptogamic or centripetal wood formation was an almost universal feature, and many other similar characters could be mentioned. The Sphenophyllales were synthetic in that they combined certain characters of their fern ancestry with features that subsequently became stereotyped in the Lepidophytes and Calamites — they are thus considered as representing an approach to the common ancestor of the balance of the Lepidophytes and of the Arthrophytes. The earliest ferns show combinations of features that subsequently became the property of different fern families; while the Pteridosperms combined the characters of ferns and cycadophytes. Another principle illustrated by paleobotany is that known as recapitulation, or the fact that, theoretically at least, the ontogeny or development of the individual is an epitome or abridgment of the phylogeny or development of the race. This principle is, however, difficult of application since its underlying factors are unknown and the ontogeny may show acceleration, modification or obsolescence that renders the bearing of recapitulation questionable unless corroborated by other lines of evidence. A familiar instance of the retention by the seedling of ancestral adult characters is furnished by the conifers, most of which have needle leaves on the shoots of the juvenile forms while with age these needle leaves of the long shoots are replaced by scales as in an adult pine or become reduced to concrescent leaves with a cyclic instead of a spiral arrangement as in the juniper, or become reduced to scales while the shoot (phylloclad) functions as a leaf as in Phyllocladus. From these changes in foliage in the earlier part of the life history of the various conifers it is inferred that the scale leaves of Pinus, the double leaf of Sciadopitys, the phylloclad of Phyllocladus, the concrescent cyclic leaves of the Cupressaceæ and the deciduous habit of the larch (Larix) and bald cypress (Taxodium) are all derived characters. Another principle is derived from the study of persistence of organisms or organs. Such conservative organisms as the Bacteria or the Cyanophyceæ have existed unchanged for millions of years. Conservative organs are those like roots, whose functions and environment have remained uniform for ages. Thus all roots are found to be much alike in their organization. Various enthusiasts have proclaimed the conservatism of the vascular cylinder, while others conceive that the parts concerned with spore or seed formation are more conservative. Foliage in general is apt to be conservative in both form and structure, as witness the similarities in the fronds of the Cycadophytes retained from the Permian to the present during which their stem structure and especially their fructifications varied through wide limits. Ginkgo leaves have an equally long history and many existing angiosperms acquired their distinguishing leaf form during the Upper Cretaceous. Another general principle derived from the study of the geological distribution of plants — a principle for the most part unrealized by biologists or meteorologists — is that relating to geological climates, of which plants are the most satisfactory known tests. The early paleobotanists drew extreme pictures of former vapor-laden atmospheres and tepid torrid climates, but these are found to have no basis. On the other hand it has become increasingly clear of late years that the sort of climate under which the history of man has been passed is an abnormal climate from the standpoint of geological history. From the first appearance of terrestrial plants in the Devonian down to the present there are only two periods at which it is possible to distinguish anything approaching climatic zoning. For example, Devonian plants are known from Ellesmere Land on the north to Australia on the south and no differences are discernible in the floras from lat. 85° and those contemporaneous in central Europe. This uniformity and cosmopolitan distribution continues throughout the Lower and Upper Carboniferous. In the Permian, however, there are well-marked floral provinces succeeding widespread glacial conditions. Again from the late Triassic throughout the Jurassic and Cretaceous there were no polar, temperate or equatorial zones — the same plants are found within a few degrees of the poles as within a few degrees of the equator. Even in the earlier Tertiary tropical floras extended half way across the temperate zones and temperate forests are known from within five degrees of the pole. At the close of the Tertiary the successive glaciations of the Pleistocene changed all this cosmopolitanism and to-day man is living in a Pleistocene climate, with well-marked climatic zones and seasonal variations. The principle may be stated thus: That for geological time, as a whole, climates have been more uniform than at present and marked variations from this uniformity are occasional and are the concomitants of glacial conditions, both apparently the results of a similar but little understood cause.

Relation to Other Sciences.— Paleobotany both contributes to and borrows from the other earth sciences. Its relation to botany in the accepted sense of that term is peculiar since Paleobotany is the botany of all geological time while botany is that of but one geological period, namely — the present. It is now quite impossible to obtain a broad foundation for phylogenetic, morphological or distributional studies of existing plants without a consideration of their extinct ancestors. In the interpretation of the far distant past paleobotany and its sister science paleozoology contribute fundamental data to geology, not only in furnishing the «medals of creation,» which constitute the best basis for a geological chronology yet discovered; not only as comprising the subject matter of the biology of the past, which is a legitimate part of earth history; but in the elucidation of the climate and other physical conditions of past times, subjects which may be embraced under the terms of Paleoclimatology and Paleoecology. Paleogeography, or the Physical Geography of past times, also derives some of its most important facts from the study of the character and distribution of fossil organisms.

Thallophyta.— As a convenience and because of their lack of importance as fossils the old term Thallophyta will be used for the great mass of thallus plants, formerly thought to constitute a single sub-kingdom but now known to represent several phylæ. The thallophytes embrace plants of the simplest type, but they exhibit nevertheless a very wide range in the structure and degree of differentiation of the vegetative body and in their methods of reproduction. The plant body may be a single minute and often motile cell multiplying by fission, or the thallus may be an aggregate of cells with a well-marked physiological division of labor, and differentiated into parts analogous to the roots, stems and leaves of the higher plants, and with a corresponding histological complexity. The thallus best-known plants to the non-botanist are bacteria, such fungi as molds and toadstools and seaweeds. With but few exceptions marine plants are thallophytes, although immense numbers are also found in fresh water and in various terrestrial habitats. In general the larger and more complex are marine and some of these are among the most gigantic of plants. The thallophytes are primitive types and their existence unquestionably antedates the geological record, although they are now known in considerable variety from the pre-Cambrian. They furnish little that is of paleobotanical interest since they are either so slightly resistant that they have left only illy defined impressions in the rocks, or, if they had hard parts as in the so-called calcareous algæ, these, while they are often abundant, as in the various limestones of Paleozoic, Mesozoic and Cenozoic age, add little to the knowledge obtained from a study of existing forms. They are, however, of great philosophic interest since they point to the steps in the evolutions of the first life forms and since also they are unquestionably the ancestors of the land plants which appear in the Devonian deposits and from which all of our existing terrestrial vegetation has been evolved. A few of the more important fossil types will be briefly enumerated. Proterozoic algæ are represented by the large concentrically laminated calcareous deposits known as Cryptozoon, as well as by other forms referred by Walcott to the genera Weedia, Collenia, Newlandia, Kinneyia, Greysonia, etc. Thousands of obscure tracings in the Paleozoic and later rocks have been described as fossil seaweeds but large numbers of these supposed fucoids have been shown to be the casts of trails, burrows and similar tracks of worms, trilobites and other marine organisms while others are rill or current markings of non-organic origin. Nevertheless there is no reason for doubting the presence of algæ from the pre-Cambrian onward, particularly when the supposed fossils show a carbonaceous residue as in the genus Spirophyton of the middle Devonian. The genus Nematophycus of the Silurian and Devonian includes gigantic forms with their internal structure preserved, the silicified stems of *N. logani* being sometimes several feet in diameter. The Diatomaceæ (Bacillariaceæ), whose siliceous frustules accumulate as oozes in the present marine and fresh waters, occur as fossils from the lower Jurassic onward. They are somtimes present in the Tertiary as relatively pure beds many feet in thickness and made up of billions of tests of these tiny forms, as in the Niocene Calvert formation of Maryland and Virginia, or in the Pliocene of California. The Chlorophyceæ or green algæ include many doubtful fossil forms and numerous others that are well authenticated, particularly in the somewhat unique group of Siphoneæ. Joints of the verticillate or tubular calcareous forms occur in the older Paleozoic (Cambrian to Silurian) where they are represented by the genera Ascosoma, Primicorallina, Sycidium, Callithamnopsis, etc. This type becomes exceedingly common at certain Mesozoic and Cenozoic horizons, as in the Mediterranean Triassic (Diploporella, Halorella, Triploporella), or the middle Eocene of the Paris Basin. Associated with the foregoing are species of Codiaceæ (Girvanella, Sphærocodium, Halimeda, Ovulites), Dasycladaceæ (Acicularia, Cymopolia, Vermiporella, Diploporella, Gyroporella). The Characeæ or Charophyta as they are sometimes called are a somewhat isolated group of fresh and brackish water forms, the stoneworts. They are doubtfully recorded from rocks as old as the Devonian and their calcareous fruits (oogonia) are present in considerable abundance throughout the Mesozoic and Cenozoic. The Rhodophyceæ (Florideæ), or red algæ, include one family, the Corallinaceæ, that is of considerable geological importance, being represented as early as the Ordovician by Solenopora, and commonly throughout the Mesozoic and Cenozoic (Lithothamnium, Lithophyllum). These are the nullipores or reef-forming types. Paleozoic bacteria have been known since 1879 and a considerable number of supposed species have been described by Renault. Proterozoic bacteria have recently been described by Walcott. Traces of fungi are commonly met with from the Devonian onward. These are usually in the form of mycelial hyphæ, both nonseptate (Phycomycetes) and septate (Mycomycetes). They occur in fossilized plant tissues, and occasionally the minute spores or traces of oogonia or sporangia are present. Berry has recently described forms in petrified Eocene palm wood in which various stages of sporangial growth and spore formation are preserved (Peronosporoides). Other specimens show zygospores or conidia (Zygosporites, Cladosporites, Haplographites, Oochytrium, etc.). Foliage preserved as impressions frequently show traces of leaf spot or other fungi and many undoubted remains of this sort have been described. All of these types of fungal remains are exceedingly common at all horizons where petrified or other plant tissues occur, but their nature largely precludes systematic study. It can be safely asserted that the fungi were of very ancient origin and were already present in great variety in the older Paleozoic. Microscopic forms of both algæ and fungi are present in abundance in oil shales and in some bog ores of iron from the Silurian down to the present time.



[*Courtesy of Johns Hopkins University*]

FIG. 2.—Geological History of the Fern Phylum (Pteridophyta).

Bryophyta.— The Bryophyta or moss plants, comprising the existing mosses and liverworts (*Hepaticæ*), which occupy so prominent a place in some evolutionary schemes are almost entirely unknown as fossils, and such as are known are either inclusive in character or confined to relatively recent periods. For a characterization of the Bryophyta the reader is referred to the article MOSSES. These plants were never of large size, nor have they ever become truly fitted for terrestrial existence. Their absence in the geological record cannot be attributed to their perishable nature since much more delicate objects have been abundantly preserved at various geological horizons. While they have been recorded from the Paleozoic, especially by the early students, these forms usually resolve themselves into fragments of Lepidophyte, Arthrophyte or Coniferophyte foliage. None are conclusively known earlier than the Mesozoic and the liverworts antedate the true mosses in the record, furnishing therefore conclusive evidence of the latter group being unknown in rocks older than the Tertiary.

Pteridophyta.— The Pteridophyta as here understood is restricted to the fern phylum — the Filicales — the so-called fern allies (club mosses and horsetails) being grouped in the phylæ Arthrophyta and Lepidophyta. The Pteridophyta are a very ancient stock, always megraphyllous and phyllosiphonic. The fructifications are borne upon but slightly modified foliage leaves and were never strobiloid. The known forms are prevailingly homosporous, although heterospory must have been evolved early in their history since the Pteridosperms are clearly derived from the early, at least pre-Devonian fern stock. Among existing ferns the Rydropterales, or so-called water ferns, of somewhat questionable relationships, are also heterosporous.

Living ferns are usually segregated into two major groups — the Eusporangiate and Leptosporangiate according as the sporangium develops from a group or from only a single cell. While this distinction is not without exception, it is one not observable in fossils, where the mature features must be relied upon. On the whole the Eusporangiate sporangia are large, attached by a broad base, with a wall more than one cell thick, and without a definite annulus, though some of the cells may be thickened; moreover in the Marrattiales, one of the important orders from the paleobotanical viewpoint, the sporangia are united to form synangia, which by some students are thought to be a modification of the sporangiophore so prominent in the Arthrophyta, and vestigial in the Lepidophyta. In the present treatment the Pteridophyta are segregated into the four classes — Cœnopteridæ, Eusporangiatæ, Leptosporangiatæ and Hydropteridæ — which will be considered separately.

The Cœnopteridæ or Prinofilices comprise a group of Paleozoic ferns known almost entirely from the anatomy of stems and petioles, the features of which are probably overestimated in discussing their inter-relationships. The group is considered to have been much wider than is indicated by our knowledge of the two families Botryopteraceæ and Zygopteraceæ, and in the accompanying phylogenetic diagram is used as the starting point of the fern phylum.

Without attempting to formulate the theoretic charters of the Eofilices or setting diagnostic bounds to the Cœnopteridæ as here used we may pass to a brief consideration of the two known families.

The Botryopteraceæ at present embraces three genera-Grammatopteris and Tubicaulis based upon Permian stem anatomy and Botryopteris based upon stem and sporangial structural remains ranging in age from the Lower Carboniferous to the Permian. Little is known of the habits or fronds of these types and they have not been definitely correlated with material preserved as impressions. They had slender monostelic stems exarch in Grammatopteris and Tubicaulis, endarch in Botryopteris, with scalariform or reticulate tracheids. In *B. forensis* the sporangia were pedicellate in groups of from two to six on the ultimate divisions of compound fronds. They were pyriform with walls of two layers of cells and on one side had an annulus several cells in width suggesting comparison with the Osmundales. The leaf-traces vary from rectangular in Brammatopteris and oval in some species of Botryopteris to omega shaped in other species of that genus.

All known Botryopteraceæ were small plants thought to have had slightly fleshy pinnules, and abundantly clothed with epidermal hairs.

The family Zygopteraceæ is based largely on a variety of structural remains of petioles, although the stem anatomy and sporangial structure are known in several instances. They range in age from the Devonian (Clepsydropsis) to the Permian. The leaf traces show a variety of complexities of form and histology and in cross section range from an hour glass or H shape to the stellate form of Asterochlæna.

The sporangial characters show considerable variation. In Zygopteris the sporangia were grouped and annulate much as in Botryopteris. In Diplolabis and Stauropteris an annulus was not developed; the former had the sporangia grouped in sori or synangia while in the latter they were borne singly on the ultimate divisions of the frond. The class as a whole shows relationships with the Ophioglossales, Osmundales and Marattiales.

The Eusporangiate class of ferns comprise two known orders, the Ophioglossales and Marattiales, the former regarded as very primitive by most students and but slightly represented in the fossil state, although the Paleozoic Rhacopteris and Ophioglossites and the Mesozoic Chiropteris have often been considered as representing this order.

The Marattiales, on the other hand, had an extended geological history. In the present state of our knowledge, confused as it is by the resemblance of Pteridosperm microsporangia to Maratteaceaus synangia, it is difficult to give a satisfactory estimate of the relative importance of the Marattiales in the Paleozoic, but they certainly occupied a prominent position, and this prominence, rests on the evidence of the cosmopolitan frond genus Pecopteris, the stem anatomy of the forms referred to Psaranius and its allies, and upon a variety of fructifications. The Psaroniaceæ were tree ferns sometimes 50 feet or more tall, with fronds in cases where actual connection has been established of the Pecopteris type, and arranged in crowded spirals (Psaronius polystich-Caulopterius impressions), in four vertical rows (Psaronius tetrastichi) or in two opposite vertical rows (Psaronius distichi-Megaphyton impressions). A very large number of species have been described from the Upper Carboniferous and Permian. They have been favorite objects of histological investigation since they are common in a petrified condition in Saxony, France and elsewhere. Anatomically the stems have a complex system of laterally elongated, concentric curved steles of scalariform tracheids surrounded by phlœm and immersed in a parenchymatous ground mass with some sclerotic bands below the leaf gaps. Some of the polyarch roots show secondary wood but none has been observed in the stems, the central one cauline and the outer ones giving off numerous leaf-traces and adventitious roots. Outside the sclernchymatous zone which bounds the stem proper is a very broad zone, formerly thought to be cortical, consisting of closely packed adventitious roots embedded in a dense felt of hairs which spring from both the stem and the roots. The petioles usually show a single horseshoe-shaped trace although sometimes a second lies within the first. The occasional presence of lacunæ in the root cortex of some of the species suggests a swampy sub-stratum.

Pecopteris fronds represent the one type among the many familiar fern-like fronds of the Paleozoic that is frequently found in a fruiting condition. Some have been demonstrated to have been borne upon Psaronius stems and this is probable of the majority. The fructifications are of a variety of types. Those known as Asterotheca had large synangia in two rows one on either side of the median vein on the under surface of the pinnules each consisting of five or six sac-like confluent sporangia forming a close ring. Other confluent synangia known as Ptychocarpus characterize an Upper Carboniferous and Permian series of Pecopterids. These synangia consist of five to eight Sporangia united laterially to form a close ring and adherent to a central receptacle and embedded in continuous enveloping tissue. They discharged their very numerous small spores through apical pores and greatly resemble the arrangement in the modern genus Kaulfussia. A third Paleozoic type is Danæites and Parapecopteris in which each pinnule bore two continuous rows of ovid sporangia more or less united and embedded in the lamina and opening by apical pores. A fourth type known as Scolecopteris shows the sori in two rows and consisting of four or five long-pointed pendant sporangia more or less confluent proxmiad united internally for about one-third their length to a central stalk, suggestive of the modern genera Marattia, Kaulfussia and Angiopteris, particularly the first. Other fructifications (Grand 'Eurya, Dactylotheca) have partially or entirely free exammulate sporangia. Many other supposed marattiaceous fructifications have been described from the Paleozoic rocks, e.g., Hawlea, Urnatopteris, Renaultia, Sphyropteris and Discopteris.

The Marattiales were represented in Triassic floras by numerous widespread forms variously referred to the genera Marattia, Marattiopsis, Angiopteridium, Angiopteris, Danæa, Danæopsis, Pseudodonœopsis, Asterotheca, Tæniopteris and Macrotæniopteris. They occur on all the continents and make a particularly large display in the late Triassic (Keuper and Rhætic) at which time palustrine, often coal-forming, conditions with apparently identical species of plants occur from the Arctic to the Antarctic and from Tonkin and Australia to Virginia, California and Chile. The identity of these Triassic Marattiales with existing forms rests on the form and venation of the fronds, the arrangement and structure of the sporangia, and even the spores.

The Marattiales were less dominant in the overlying Jurassic and they were still more reduced during the Lower Cretaceous (Angiopteridium, Nathorstia, Tæniopteris).

Subsequent to Lower Cretaceous times Marattiaceous remains are infrequent although occasionally brought to light in the Upper Cretaceous and Tertiary. A Marattia is described from the English Eocene and a second from the French Oligocene.

The order Osmundales includes the two recent genera Osmunda and Todea with large sporangia arranged in small groups, in linear and often confluent sori, or clustered around the axis of the much reduced fertile pinnæ. An annulus is represented by a group of thick-walled cells below the apex. These stand somewhat apart from the balance of existing ferns and are wide-ranging forms, some of which are found on all the continents, Osmunda being cosmopolitan and Todea antipodean. Aside from morphological considerations the evidence that the Osmundales constitute a relatively primitive line of fern evolution is furnished by impressions like *Todea Lippoldi* Stur from the Lower Carboniferous of Silesia, petrified sporangia such as *Todeopsis primæva* Renault from a similar French horizon or Sturiella from the German Upper Carboniferous, and finally by the phylogenetic series of petrified stems described by Kidston and Gwynne Vaughan, among which the genera Bathypteris, Anomorrhœa, Thamnopteris and Zalleskya come from the Upper Permian (Thuringian) of the Ural region. Space does not permit a description of their histology but it may be pointed out that the order appears to have been derived from an ancestor with a solid stele like the Cœnopteralian species *Diplolabis Rœmeri* and to have undergone an evolution more or less paralleling that of the Zygopteraceæ. The stem is continued by Jurassic and Lower Cretaceous species of Osmundites from South Africa, New Zealand and Canada, and by Tertiary species from England, South America and Hungary. Impressions of both sterile and fertile fronds allied to Todea are abundant and cosmopolitan in the late Triassic and Jurassic and continue into the Cretaceous, while Osmunda-like fronds are common throughout the Lower and Upper Cretaceous and Tertiary in all parts of the world.

A class of ferns including the existing heterosporus Rhizocarps or so-called water fern includes the order Hydropterales and possibly an extinct order the Sagenopterales. The two existing families, Marsiliaceæ and Salviniaceæ, are small, more or less widespread aquatic forms. The Salvinaceæ contain the genera Azolla and Salvinia with between 15 and 20 existing species of the warmer regions and the leaves of the latter, not appreciably different from those of the existing species, are found throughout the Tertiary period.

The Marsiliaceæ consists of three genera — the monotypic Brazilian Regnellidium, Pilularia with about six species and Marsilia with over 50 widely distributed existing species. The last has been found fossil as early as the Upper Cretaceous but is rare and more or less uncertain in the fossil state. The extinct genus Sagenopteris is based for the most part on groups of two to five large asymmetrical reticulate veined pinnules borne digitately at the apex of a long and rather stout stipe, and found as impressions from the Triassic to the Cretaceous. Associated with some of the older forms are oval or spherical bodies thought to represent sporocarps.

The remainder of the living and fossil ferns excepting certain illy understood extinct types such as the Devonian and Lower Carboniferous Archæopteridæ and the Mesozoic Tempskya, may be grouped together in the Leptosporangiate or Eufilicalean order Polypodiales, although there is some evidence for recognizing the Gleicheniales and Matoniales as independent orders.

The Polypodiales embrace the great majority of living ferns and include the most specialized and abundant families. Without taking space to give their diagnostic characters, it will be desirable as well as interesting to glance at the geological record of the various families.

The family Schizæaceæ with between 75 and 100 existing, mostly tropical species, segregated into the genera Schizæa, Lygodium, Mohria and Anemia, appears to be present as early as the Upper Carboniferous in the genus Senftenbergia. Triassic forms are not certainly recognized but the Jurassic genus Klukia shows fructifications that render its reference to this family conclusive. During the Lower Cretaceous the genus Ruffordia of Europe and America appears to represent the genus Anemi while Schizæopsis, found in a fruiting condition in the Lower Cretaceous of Virginia, represents Schizæa. The genus Acrostichopteris, based upon sterile fronds which range from the bottom to the top of the lower Cretaceous, and found in both Europe and America also almost certainly represents an extinct type belonging to this family. In the Upper Cretaceous petrified sporangia of the Schizæa type have been found in Japan (*Schizæopteris mesozoica*). Undoubted species are common and widespread during the Tertiary.

The family Gleicheniaceæ embraces about 100 tropical and subtropical gregarious species now segregated to form the genera Gleichenia, Platyzoma, Dicranopteris and Stromatopteris — the last monotypic on New Caledonia and Platyzoma monotypic in northern Australia. The family is evidently an old one and appears to be present as early as the Carboniferous in the genus Oligocarpia which had sphenopteroid foliage and circular sori consisting of from 6 to 10 pyriform sporangia with a complete transverse annulus (Zeiller 1888, *vide* Scott, 1908). The Carboniferous genus Gleichenites Göppert and the dichotomous branching genera Mariopteris Zeiller and Diplothmema Stur are all now considered as probable Pteridospermophytes and it is evident that the Gleichenoid habit of growth was common in both Paleozoic and Mesozoic and is without especial bearing on botanical relationship. The family is not known to have been abundant in the Triassic or Jurassic, the Keuper genus Mertensides of Fontaine being often referred to the Marattiales. A species of Gleichena with well-marked fructifications is, however, recorded from the Keuper of Switzerland and the genus is known from the Rhætian of Franconia. Jurassic species are recorded from California, India, Italy and Poland. Throughout the Cretaceous Gleichenia becomes almost worldwide in its distribution. While the number of species has probably been excessively multiplied the records show 15 Lower Cretaceous forms. No less than 25 different species have been recorded from the Upper Cretaceous. Gleichenia becomes much less abundant in the Tertiary and all of the known Tertiary records are pre-Miocene. Four species are known — two Oligocene species in Saxony, an Eocene or Oligocene species in Nevada and a middle Eocene species in the south of England.

The family Matoniaceæ, with but two existing species of Borneo and the Malay Peninsula, was prominent in older Mesozoic floras from the Upper Triassic through the Jurassic, at which time it was represented by a variety of widespread species referred to the genera Laccopteris and Matonidium. Still more interesting is the family Dipteriaceæ with a single existing genus, Dipteris, with but four species confined to the Malayasian region and found growing in association with Matonia. The Dipteriaceæ became dominant slightly earlier than the Matoniaceæ and the magnificent fronds of some of the species are exceedingly common in the Triassic at which time the genera Dictyophyllum, Clathpopteris, Thaumatopteris and Camptopteris are represented. They had lyre-shaped fronds of large size, consisting of many separate or slightly united, serrate-margined and netted-veined pinnules, arranged digitately on a forking stipe. Clathropteris and Dictyopillum survived into the succeeding Jurassic where they were on the wane, becoming replaced in the Cretaceous by forms more like the modern Dipteris and referred to the genus Protorhipis (Hausmania).

The family Hymenophyllaceæ, comprising the existing filmy ferns, is practically unknown in the fossil record although several Paleozoic genera (Hymenophyllites, Rhodea, Acrocarpus) have been referred to it upon insufficient grounds.

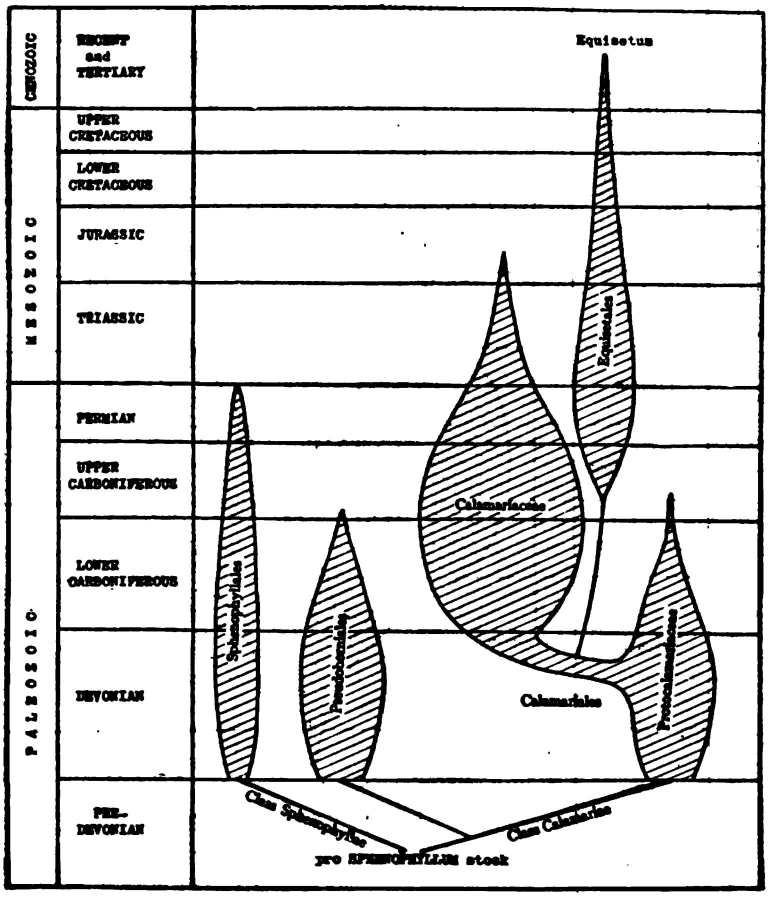
Without mentioning the various small modern families unknown in the fossil state there remains the two families Cyathaceæ and Polypodiaceæ. The former are almost exclusively tree ferns in the modern flora. They are represented in the Mesozoic by Coniopteris, Dicksonia and Thyrsopteris, to which Dennstædtia is added in the Tertiary.

The Polypodiaceæ, which comprise the bulk of existing ferns and exhibit a very great variety in form and habit, are relatively modern. Some at least of the older Mesozoic species which are referred to the form genus Cladolphlebis belong to this family. Cladolphlebis which appeared in the Triassic became cosmopolitan in the Jurassic and Lower Cretaceous where it was associated with species of Onychiopsis, Asplenium, Dryopterites, etc. Pteris, Onoclea and other genera are added in the Upper Cretaceous and a great variety of generic types appear in the Tertiary (Adiantum, Polypodium, Acrostichum, Oleandra, Woodwardia, etc.).

Arthrophyta.— The Arthrophyta constitute a well-marked phylum and comprise plants ranging in size from herbaceous forms to large trees and found from the oldest horizons containing land plants down to the present. They are characterized by invariably articulated and prevailingly-ribbed stems, the leaves in whorls (verticillate) at the nodes and free or more or less connate, dichotomously compound in the earlier groups (Pseudoborniales, Protocalamariaceæ), palmately laciniate in some Sphenophylleæ, progressively reduced during the history of the phylum until in the modern forms the stems and branches perform most of the photosynthesis. They are all sporangiophoric and strobiloid, although there is a considerable range of variation in morphological and histological details. Some are homosporous and others heterosporous. The phylum is unique in that it attained its maximum development in the Paleozoic and has been practically unrepresented since Triassic times except by the single genus Equisetum, which survives to the present with less than two score ubiquitous and rather uniform species. The phylum appears to have been of Pteridophytic origin and to have been primitively megaphyllous. Taxonomically it corresponds rather closely with the Articulatæ of Lignier and the Sphenopsida of Scott. As known at the present time it consists of two classes — the Sphenophyllæ and the Calamariæ, and the latter includes three rather well-defined groups or orders, namely — the Psuedoborniales, the Equisetales and the Calamariales — the last including two families, the Protocalamariaceæ and the Calamariaceæ.

The most primitive of these subordinate groups constitutes the class and single order Sphenophyllales of the class Sphenophyllæ. This was a synthetic alliance of mostly small forms that combined certain fern characters with those of the Calamariæ on the one hand and the Lepidophyta on the other. They are regarded as representing the specialized descendants of a pro-Sphenophyllum stock which was more truly intermediate between the Arthrophyta and Lepidophyta and which is supposed to have flourished in pre-Devonian.

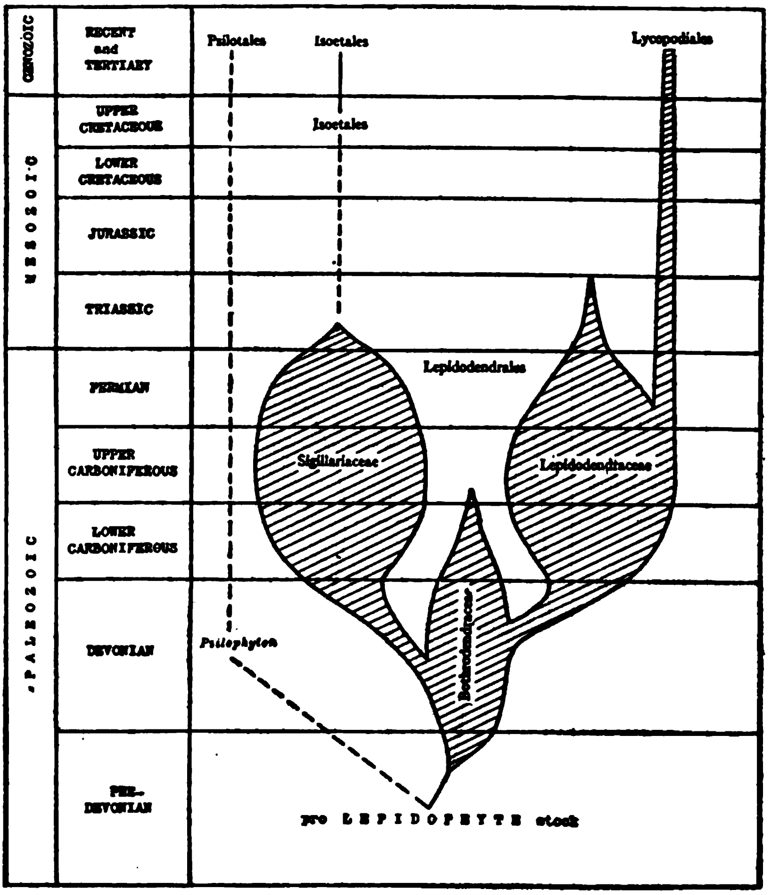
Sphenophyllum ranged from the Devonian to the Permian and was practically cosmopolitan except for its partial extinction in Gondwana Land during and immediately subsequent to the Lower Permian glaciation. A considerable number of rather uniform species based for the most part upon the impressions of the slender jointed ribbed stems with nodal whorls of cuneate leaves (hence the generic name) are known. The ribs did not alternate at the nodes and consequently the leaves of successive whorls were superposed and not alternating. The leaves, normally six to a whorl and cuneate with entire or toothed apical margins, were frequently dichotomously laciniate and in some forms with numerous narrow leaves in each whorl these are legitimately regarded as corresponding to the laciniate segments of the digitately-leaved species. The stems branched frequently at the nodes. The fructifications were fairly large cones, superficially resembling those of calamites. The stem anatomy was characteristic and sufficiently unique. In the centre there was a triangular strand of primary wood without any pith or parenchyma and either triarch or hexarch in structure, with the protoxylem or primitive spiral elements at the angles and centripetal in its development. The spiral elements sometimes pass into articulate tracheids and the later and more central tracheids are pitted. Secondary wood formation commenced early in the ontogeny by the activity of a normal cambium. The secondary wood had its elements very regularly arranged and consisted of radial series of large tracheids with bordered pits, chiefly on their radial walls. Interspersed among the tracheids were vertical strands of parenchyma connected radially by short cells or strands that did not form continuous medullary rays. Beyond the normal cambium was the phlœm surrounded by internal periderm formed by a phellogen, first in the cortex and subsequently passing inward until it arose in the phlœm itself. In Sphenophyllum insigne, a Lower Carboniferous form of Britain and Silesia, the stem was rather larger than the average although still not over a centimeter in diameter, and differed in having continuous medullary rays, so that the complicated system of vertical and radial parenchyma of the later forms may have been a derived rather than a primitive feature. The leaf anatomy presents no unusual characters except its strong mechanical construction, thus precluding the idea advanced by some botanists that the Sphenophylla were aquatic forms. The root anatomy shows no features of special interest. At least seven types of cone organization are known, indicating generic differences unsuspected from the external appearance or vegetative habits of the plants. In some fructifications the slender cones consisted of a central axis with whorls of proximally connate bracts, the latter with long imbricated pointed tips. Each bract bore two slender, one long and the other short stalked sporangiophores, so that there were two concentric series to each whorl of bracts. A single pendulous sporangium was borne at the tip of each sporangiophore. The spores were somewhat variable in size which has been interpreted as indicating incipient heterospory and appear to have been all of one kind. A second type (Bowmannites) had similarly connate whorls of imbricated fracts, each of which enclosed three concentric verticils of short-stalked bisporangiate sporangiophores. A third type (*S. fertils*) had peltate bisporangiate sporangiophores but was unique in that both the dorsal and ventral lobes were fertile, i.e., the sterile bracts or morphologically dorsal foliar lobes were replaced by sporangia-bearing fertile lobes. A fourth type (*S. majus*) had lax cones made up of repeatedly forked bracts each with four sessile or very short-stalked sporangia on their upper (morphologically ventral) surface. A fifth type (*S. trichomatosum*) had a single sporangium near the axis on each bract. In a sixth form (*S. marginatum*) the sporangiophores were borne on the axis instead of on the bracts. A seventh and remarkably complicated type known as Cheirostrobus is often made the type of a distinct family, the Cheirostrobaceæ. It is unfortunately known only from a few petrified cones from the base of the Lower Carboniferous of Scotland. These cones were large, three to four centimeters in diameter and about 10 centimeters long, and consisted of closely packed verticils of compound sporophylls, each consisting of three upper (ventral) fertile lobes and three lower (dorsal) sterile lobes. Each of the fertile lobes or sporangiophores bore four radially elongated homosporous sporangia. The second class of arthrophytes — the Calamariæ, include three orders, the ancient Pseudoborniales, the Calamariales comprising the large and diversified calamites of the Paleozoic and the Equisetales, sparingly represented in the Paleozoic, somewhat more abundant in the Mesozoic and represented in the existing floras as the sole survivors of the whole arthrophyte phylum. The Pseudoborniales are imperfectly known, being based upon impressions from the upper Devonian of Bear Island. The main stems were of considerable size, reaching 10 centimeters in diameter, with non-alternating ribs. The leaves, of relatively larger size, were in whorls (probably in fours) short-stalked and palmately and repeatedly dichotomous. The fructifications were long, lax cones with whorled sporophylls resembling reduced vegetative leaves and the sporophylls bore sporangia on their lower surfaces. These important plants, unfortunately too little known, show decisive evidence of megaphyllus ancestry. The Protocalamariaceæ, which are common in the Devonian and Lower Carboniferous, occurring as late as the Pottsville formation of the Upper Carboniferous, are generally referred to the genus Archæocalamites, although the terms Bornia, Protocalamites, Asterocalamites, etc., have also been used. The stems most frequently preserved as casts were often of considerable size; they show low, flat, non-alternating ribs separated bv shallow furrows; the internodes were of unequal lengths and the lateral branches were irregularly grouped at some and not at other nodes. The leaves were free and in whorls; they were narrow and lanceolate or repeatedly dichotomous with linear or filiform segments. According to Renault the pith cavity was large and surrounded by a woody cylinder of wedge-shaped groups of tracheids with secondary rays. A carinal canal was located at the apex of each primary group and the primary rays were shut off by interfascicular wood early in the course of secondary thickening. In a stem from the basal Carboniferous of Scotland a considerable arc of centripetal wood was formed inside the carinal canal. Such incomplete accounts as are available indicate that the cones may have exhibited variations comparable with those among the Sphenophyllas. In the cones described by Renault there were no sterile bracts and each sporangiophore bore four sporangia, while in other cones (Pothocites) sterile bracts appear to have been more or less developed. The leaves suggest the Pseudoborniales and some of the Sphenophyllæ; the stele was like that of a calamite, while the absence of sterile bracts in some of the cones suggests the Equisetales. There can be no doubt but that the Protocalamariaceæ represent a more synthetic group than the Calamariaceæ although probably ancestral to them and the Equisetales. The family Calamariaceæ was one of the dominant groups of plants during the Carboniferous and various of its members often reached a large size with a corresponding complexity of structure. Pith casts upwards of 30 feet in length and 12 inches in diameter have been recorded and Grand'Eury estimated the height of some of the French calamites as about 100 feet and with a trunk diameter of several feet. Secondary wood was usually formed, although the common mode of preservation was as casts of the fistular medullary cavity. The vascular bundles usually alternated at the nodes. The foliage of the Carboniferous forms comprised two main types, namely, Asterophyllites, in which the leaves were linear univeined and generally free from the others of the nodal whorl. This type of foliage was very common and it would seem that the bulk of the calamites had foliage of this sort. The second type of foliage known as Annularia was like the former in habit but the leaves were relatively broader, of unequal lengths in each whorl, and appear to have been slightly connate proximad. It is impossible to correlate foliar branches with stem casts, cones and structural material, so that while all of the parts of the calamites are well known, in different examples it is necessary to maintain these different categories for the different classes of remains. The foliage varied considerably not only from species to species, but on the same plant, and while the two foregoing types constitute useful form genera it is not always possible to differentiate sharply between them. The genus Nematophyllum of the West Virginia Permian shows greatly elongated linear leaves from 10 to 20 in a whorl and suggests a modification in the direction of the Triassic Schizoneura and Neocalamites. Schizoneura, a type of the Permian and Triassic, had leaves which were at first united in a sheath or in several broad sheath segments that subsequently split into a varying number of multiple-veined divisions. Neocalamites of the Triassic had free univeined leaves in some of the late Triassic species greatly resembling those of Annularia. Phyllotheca, a Permian and early Mesozoic type, had acicular slightly connate univeined leaves and sporangia borne on peltate sporangiophores alternating with whorls of sterile bracts. Nematophyllum, Schizoneura, Neocalamites and Phyllotheca are all based upon impressions so that a knowledge of the structure or the details of organization of their fructifications is unfortunately wanting. Structurally calamite leaves show a central trace surrounded by a broad zone of mesophyll. Several generic types of calamites have been based upon stem anatomy. These include Arthropitys (the Calamites vara of British botanists) in which the pith was large and hollow except peripherally, with persistent diaphragms at the nodes. Surrounding the pith was a ring of collateral vascular bundles, the protoxylem in all but the youngest stems being disorganized to form longitudinal passages known as carinal canals. The wood was entirely centrifugal in its development. Secondary wood formation started early and consisted of scalariform or radially pitted tracheids and variable rays which continued with undiminished width through the vascular cylinder or tapered outward or were abruptly shut off by interfascicular wood. The cortex consisted of an inner thin-walled zone of cells and an outer denser zone in which there was a very great development of periderm. The courses of the leaf traces was somewhat varied and more complicated than in the Equisetales, otherwise Arthropitys was much like an Equisetum with the addition of secondary thickening. A second type known as Anthrodendron and confined to the British coal measures had a thin zone of wood in which the primary bundles were widelv separated by the principal rays which consisted of elongated fibrous elements (prosenchyma) within which there were secondary rays of parenchyma like those of the secondary wood. In the latter the tracheids are reticulate and the infra nodal canals very large. A third type, Calamodendron, of the European Upper Carboniferous and Permian, had radical bands of prosenchyma containing secondary rays between the normal rays and the radial bands of secondary wood. The roots of calamites preserved as impressions, of widespread occurrence, are known as Pinnularia. Structural root material, known as Astromyelon, shows a usually persistent pith surrounded by a ring of centripetally developed primary wood alternating with groups of primary phlœm. The zone of secondary wood was wide; the endodermis appears to have been double; and the cortex was very thick with large lacunar intercellular spaces, denoting a swampy or aquatic habitat. Great numbers of a variety of calamite cones are known from impressions, as the large cones of Macrostachya, the more openly constructed cones of Huttonia, and the curious cones of Cingularia. The two types Calamostachya (Volkmannia) and Palæostachya are also represented by a considerable amount of petrified material with the structure preserved. In Calamostachya the whorls of peltate sporangiophores, each bearing four pendant sporangia alternate equidistantly with usually twice as numerous sterile bracts, connate or free basally flexed and imbricated proximally. In some species the spores appear to be all of one kind (homosporous), although they are somewhat unequally developed. Other species were heterosporous although both microspores and megaspores were borne in the same region of the cone. Still other species had radial sterile plates connecting the sporangiophores with the adjacent bracts, thus enclosing each group of four sporangia in a radial compartment. Although the sporangiophores were borne on the cone axis midway between the whorls of sterile bracts their supply bundles have a common origin forking at the nodes and that of the sporangiophore passing upward more or less across the interval of the internode and then bending downward and entering the sporangiophore, thus indicating that although widely removed from the bracts the sporangiophores were morphologically their ventral appendages as in Sphenophyllum. Calamostachya is usually, but not invariably, associated with the Asterophyllites type of foliage. Petrified material of Palæostachya is less common than that of Calamostachya. The former cones differ in having the sporangiophores inserted in the axils



[*Courtesy of Johns Hopkins University*]

FIG. 3.—Geological History of the Arthrophyta.

of the bracts and inclined upward — features usually discernible in impression material. The bracts were imbricated and more or less connate proximad. The sporangiophores, half as numerous as the bracts, bore four pendant sporangia from their peltate tips. Some cones appear to have been homosporous and others heterosporous. It has been commonly assumed from the axillary position of the sporangiophores that Palæostachya was more primitive than Calamostachya, but in one species at least of the former the supply bundles pursue a similar at first ascending and subsequently descending course similar to what obtains in Calamostachya.



[*Courtesy of Johns Hopkins University.*]

FIG. 4.— Mutual Relationships of the Lepidophyta.

Some of the Palæostachya cones were of large size and they are usually associated with the Annularia type of foliage. Macrostachya is the name applied to exceedingly large cones of calamites preserved as impressions. They show considerable variation and are said to have been heterosporous. Huttonia includes large cones somewhat resembling those of Macrostachya but more open and characterized by a disc-like protective flange pendant from the bract whorls. Cingularia comprises long and lax cones with widely spaced whorls of coherent bracts at right angles to the axis, subtended by whorls of nonalternating sporangiophores, equal in number to the bracts. The sporangiophores were ligulate and divided distad and each division bore two large pendant sporangia.

The final order of the Calamariæ, the Equisetales, consists of the single family Equisetaceæ and comprises at the present time the single genus Equisetum with 25 to 30 rather uniform, widely distributed, mostly small and chiefly temperate species of scouring rushes or mares' tails. The cones are terminal on fertile shoots or on branches from the vegetative shoots and entirely lack sterile bracts. They consist of peltate sporangiophores carrying from five to 10 homosporous sporangia. The rhizomes or underground stems of the species with annual shoots commonly form tubers and these often occur abundantly as fossils as in the Lower Cretaceous of Maryland. The Equisetales were represented by a number of small and imperfectly known Paleozoic species referred to the genus Equisetites. During the Triassic they were represented throughout the world by stem casts, often of large size, with alternating ribbed stems and the leaves united into sheaths at the nodes. They continued as not uncommon types throughout the Jurassic in all parts of the world, decreasing gradually in size and abundance during the later Mesozoic until their status and size in the Cenozoic floras was much as in the existing flora.

The generalized geological ranges of the various arthrophyte groups as well as their relative importance at different periods and their filiation are shown in the accompanying diagram (Fig. 3).

Lepidophyta.—The Lepidophyta occupy a somewhat isolated position among vascular plants although there are not wanting students who connect them with the Hepaticæ or the Spenophyllales on the one hand, and with the seed-bearing plants on the other The phylum includes the tiny existing quillworts and herbaceous clubmosses as well as the often gigantic Lepidodendrales which occupied such a prominent position in Paleozoic floras.

Features which serve to unite the somewhat diverse members of this phylum are the small simple leaves, spirally arranged and not vertillate as in the Arthrophyta. All the known Lepidophytes are microphyllous, the only departure from a simple type of leaf being the double leaftrace in the Paleozoic Sigillariopsis. A second consistent feature is the presence of branch gaps and the absence of leaf gaps in the vascular cylinder, which is thus cladosiphonic, with an exarch protostele. A third feature is the apparently simple relation between the sporangium and the sporophyll, which can be interpreted as due to progressive sterilization according to Bower's well-known theory, or may be explained as a reduction from the same or similar sporangiophoric ancestors that give rise to the Arthrophytes phylum.

The Lepidophyta are prevailing strobiloid and are known from the Devonian to the present. Some are homosporous, other heterosporous while still other Paleozoic forms had practically crossed the boundary that separates spore production from seed formation. Further details are best given in the discussion of the various types which follow. The mutual relationships of the different members of the phylum are shown in the accompanying diagram (Fig. 4) and in the light of present knowledge may be expressed in tabular form in the following manner:

Order Lypidodendrales	Family Bothrodendraceæ " Lepidodendraceæ " Sigillariaceæ
Order Lycopodiales	Family Lycopodiaceæ " Selaginellaceæ

Order Isoetales—Family Isoetaceæ
Order Psilotales—Family Psilotaceæ

It will make for clearness to consider the existing forms and their fossil representatives before describing the wholly extinct Lepidodendrales. The Lycopodiales comprise two families. The Lycopodiaceæ include two genera, Lycopodium and Phylloglossum. Lycopodium has about 100 widely distributed existing species of mostly perennial erect or trailing herbaceous forms of shaded woods, marshes, etc., some tropical species, epiphytes. But one kind of spores are formed and the sporangia are borne on or in the axils of scarcely modified foliage leaves more or less distinctly aggregated into strobili.

Fossil species of Lycopodium or Lycopodites, which is often preferred as a less definite name, are especially liable to be confused with the foliage of some of the Lepidodendrales or Coniferophytes unless represented by fructifications. Among the rather numerous forms referred to Lycopodites and scarcely different from the existing forms may be mentioned *L. Stockii*, Kidston from the Lower Carboniferous, *L. Gutbieri*, Göpp, and *L. Reidii*, Penhallow from the Devonian; *L. macrophyllus*, Goldenberg; *L. Zeilleri*, Halle from the Upper Carboniferous; *L. lanceolatus* (Brodie) and *L. Scanicus*, Nath, from the Upper Triassic; *L. falcatus*, *L.* and *H. L. tenerrimus*, Herr; *L. victoriæ*, Seward from the Jurassic; and *L. cretaceum*, Berry from the Upper Cretaceous. While Lycopodium like forms were never apparently very different from what they are at present, they represent a very ancient line and were present as a minor element associated with the diversified arboreal Lepidophyte flora of the Paleozoic.

The genus Phylloglossum contains a single reduced species of Australia and New Zealand and is unknown in the fossil state.

The second family, the Selaginellaceæ, consists of the single genus Selaginella with about 500 species of mostly mesophytic small plants not differing greatly from the Lycopodiaceæ except that after the mother cell stage the spores differentiate into micro and megaspores. The foliage is usually dimorphic and both foliage leaves and sporophylls have a ligule. The cones are not highly differentiated from the vegetative leaves. Sometimes but one megaspore is developed in a sporangium and fertilization may take place before shedding, thus illustrating steps in the acquisition of the seed habit. Fossil species of Selaginella, unless they are fruiting, are not certainly distinguishable from Lycopodites, nevertheless several undoubted species have been recorded from the Carboniferous (*Selaginellites Suissei* Zeiller, *S. primævus* Goldenberg, *S. elongatus* Gold, *S. ciliatus* Kidst). Less authentic species are recorded from Mesozoic and Cenozoic deposits of widely scattered regions.

The second order, the Isoetales, consists of the single genus Isoetes with about 60 existing aquatic or palustrine species with a reduced tuberous stem and a crowded rosette of grasslike ligulate leaves, which are relatively larger than in the majority of Lepidophytes. Microspores and megaspores are produced, both characterized by their large size and by the formation of trabeculæ or strands of sterile tissue often completely dividing the sporanglia cavity. Secondary thicking occurs and morphological resemblance to the ancient Sigillaris and modern Monocotyledons have frequently been insisted upon although without logical basis. Fossil forms are exceedingly rare, Saporta recorded a form from the Lower Cretaceous (Barremian) of Portugal (Isoetites Choffati). Aside from untrustworthy records Isoetes occurs in the Oligocene of France and the Miocene of Switzerland.

The third order, the Psilotales, is one which has excited a great deal of discussion. It comprises the two genera Psilotum and Tmesipteris; the former with two species of both tropics and the latter with a single Australasian species, although more are frequently recognized. Both genera are considered to be more or less saprophytic. The sporophylls of Psilotum consist of a much shortened bifurcated axis bearing a bilocular or trilocular synangium producing but one kind of spores. In Tmesipteris the sporphylls alternating with foliage leaves or more or less zonal in their development, consist of a short axis terminating in a pair of lancellated lobes and bearing adaxially an elongated bilocular slightly stalked synangium, and producing but one kind of spores. Both genera show a decided tendency toward repeated branching of the sporophylls, a feature much emphasized by Thomas, Scott and Bower, but believed by the writer to be without significance. Whether the sporophyll be regarded as morphologically a branch or a leaf is disputed.

Those who accept the latter view regard the Psilotales as sporangiophoric and closely related to the Spenophyllales. Others consider that the necessities of nutrition of large sporangia with many spores resulted in the formation of sterile plates such as occur in Isoetes and in the sporangia of some of the Lepidodendrales and regard the bi- or trilocular sporangia of the Psilotales as septate unilocular sporangia. The view that these masses of sterile tissue may represent vestiges derived from sporangiphoric ancestry has not been sufficiently emphasized and will be referred to in a subsequent paragraph. Meanwhile it may be said that the action of Scott and others in separating the Psilotales from the Lepidophytes and grouping them with the Arthrophytes is greatly to be deprecated. The fossil history of the Psilotales is unknown. Various fragmentary specimens described as Psilotales are without value. Among the doubtful forms that have been related on the Psilotales are the Devonian genera Psilophyton, Dimeripteris and Pseudosporochus and the Permian genus Gomphostrobus.

The order Lepidodendrales merits a more extended consideration. It consists of three well-marked families, the Bothrodendraceæ, Lepidodendraceæ and Sigillariaceæ, very prominent in Paleozoic floras. Although herbaceous remains are known the vast majority of the Lepidodendrales were arborescent and some of them reached a height of 100 feet or more. The most ancient of these families, the Bothrodendraceæ, unites in many respects the features that later characterized the Sigillaraceæ on the one hand and the Lepidodendraceæ on the other. The Bothrodendraceæ are especially characteristic and cosmopolitan during the Devonian and Lower Carboniferous. A number of generic types have been recognized although our information regarding them is vague in a good many particulars. Bothrodendron, or Cyclostigma as it has frequently been called, is not very different in appearance from some species of Sigillaria. The stems were dichotomously branched. Bolsters are usually wanting and the leaf scars are remote, small and circular or rhomboidal; they show a central leaf trace scar and two lateral parichnos scars; immediately above and close to the leaf scar is a small ligular pit. The leaves were small, linear lanceolate, univeined and more or less persistent. In one species (*B. punctatum*) the self-pruning of branches resulted in the large scarred impressions known as Ulodendron. The term Rhytidodendron has been used for some species and recently the genus Porodendron has been proposed for certain forms from the Lower Carboniferous of Russia and Spitzbergen that were formerly referred to Bothrodendron. Anatomically the stems show either a small pith or a solid core of wood with external protoxylem. The secondary zone of wood was thin and the cortex was less differentiated than in the Lepidodendrales.

A cone, *Lepidostrobus Olryi* Zeiller, which is considered to have belonged to *Bothrodendron minutifolium* is of the usual Lepidostrobus type with elongated sporangia. A small cone with a histology that suggests its having been borne by *Bothrodendron mundum* lacks the radially elongated sporangia and instead has them extended upward inside the sharply flexed bracts and is conspicuously ligulate. It bore microsporangia in the distal and megasporangia in the proximal region. Another type of cone *Lepidostrobus Zeilleri,* which may belong to *Bothrodendron tenerrimum,* appears to lack sterile bracts.

Another genus, distinguished from Bothrodendron by the surface ornamentation of fine raised lines between the remote leaf scars, is Pinakodendron. Several species have been described and in one, *P. Ohmanni*, the megasporangia were borne on the basal adaxial faces of the sporophylls of the same size and form as the foliage leaves on certain parts of the branches but not terminal as were most Lepidophyte cones.

Other genera of somewhat doubtful affinity are Leptophlœum in which the leaf scars are more crowded, and Omphalophloios in which rhomboidal bolsters were developed. Leptiphlœum occurs in the Devonian or Lower Carboniferous of North America, Europe, Asia and Spitzbergen while Omphalophloios is found in both America and Europe.

Other related forms are referred to the genus Archæosigillarea or Protolepidodendron. The most remarkable of these is a large trunk from the Middle Devonian of New York, five meters in length and 38.5 centimeters in diameter at the swollen butt, and 12 centimeters in diameter at the distal end. In appearance the slender arching bifurcating branches with the subulate falcate persistent leaves gave it a weird aspect. The swollen base and tapering stem indicate some secondary thickening. At the base rootlets similar to these of Stigmaria are preserved. The leaf cushions at the base are distant and irregular. Higher up they are in vertical rows on ribs separated by angular furrows as in Sigillaria while still higher up they pass gradually into typical rhomboidal spirally arranged Lepidodendron bolsters. The leaf scars are in the upper part of the bolsters, obovate in form or slightly cordate above, and show a subcentral leaftrace scar flanked by crescentic parachnoi with a well-marked ligular pit immediately above the margin.

Protolepidodendron thus unites the features of Lepidodendron and Sigillaria in one synthetic type and it seems probable that the majority of Devonian forms that have been referred to these two genera really represent Protolepidodendron. Other species have been recorded from various European Devonian localities.

The majority of Lepidodendrons were tall trees reaching in some cases a height of 40 meters, with a straight shaft unbranched for a long distance above the ground, with a dense crown of dichotomously forked branches covered with crowded masses of long narrow simple spirally arranged leaves, and with large terminal cones. The leaves were ultimately shed from the older portions of the trunk and the geometrically sculptured stems are among the commonest of Carboniferous fossils affording the characters by which several hundred species have been distinguished and utilized for stratigraphic purposes.

The essential features of the surface markings are of considerable importance. The leaf cushions or bolsters were crowded in spiral arrangement with angles above and below, and rounded sides (rhombic), always longer than broad and truncated above the middle where the abscission of the leaf occurred. The leaf scar is subcircular and shows three scars, a central one representing the leaf trace and laterals on each side known as parachnoi. Just above the leaf scar is a small triangular print left by the ligule, while below the leaf scar there are frequently two rounded prints or depressions on either side of the keel which like the parachnoi are tracts of thin-walled tissue which functioned as aërating tissue. Other markings of an ornamental character are frequently present on the bolsters. With the decay of the cortex the characteristic Lepidodendron features gradually become obliterated. If merely the epidermis is gone the resulting features are those of Bergeria once thought to represent an independent genus. If decay has removed part of the cortex the forms are known as Aspidaria, and if all of the outer cortex is gone showing the imbricated leaf-traces it is known as Knorria.

Anatomically the stem is monostelic with centripetal primary wood which may extend to the centre or enclose a pith. There is usually a considerable development of centrifugal secondary wood consisting of scalariform tracheids and medullary rays. Primary phlœm has been recognized but there is some doubt regarding the presence of secondary phlœm or of any persistent cambium. In forms that have not been demonstrated to have formed secondary wood secondary thickening takes place in the outer cortex through the development of a periderm.

Leaf traces, collateral in structure, pass off from the stele without leaving any gaps and pass obliquely through the cortex to the leaves, each leaf receiving a single bundle. The cortex is of great thickness and variable according to age and species. Usually there is an inner parenchymatous zone poorly preserved. The outer cortex consists of thicker walled elements, usually with an enormous development of phelloderm, which served for mechanical support.

The leaves had a single central vascular bundle surrounded by a sheath of transfusion tissue and the stomata were commonly restricted to two deep grooves on the lower surface. What corresponds to the roots in higher plants are peculiar organs known as Stigmaria, which as casts or impressions are among the commonest Coal Measure fossils, particularly in the underclays beneath the coal seams. In complete specimens the main axis is seen to divide into four main forks which run horizontally and branch dichotomously. The surface is smooth or irregularly wrinkled and covered with well-spaced umbilicate scars to which in well-preserved material cylindrical radiating rootlets are seen to diverge. These are slightly constricted at the base and lack roothairs. The main axis consists of a central pith, a ring of centrifugal wood accompanied by phlœm and surrounded by a cortex with abundant periderm. Sometimes no distinction between primary and secondary wood is observable while in other specimens centripetal primary wood is present. The rootlets show a different anatomical arrangement each containing a monarch stele with radial vascular strands connecting the protoxylem with groups of cortical tracheids. They arise from the inner margin of the primary wood although the outer cortex is continuous with that of the main axis.

Stigmaria have frequently been found attached to both Lepidodendron and Sigillaria trunks. There has been much discussion regarding the morphological nature of Stigmaria since they do not conform to the usual morphology of true roots, but whatever their morphological homologies, physiologically they are roots.

The fructifications of the Lepidodendraceæ have been described under a variety of generic names, the most common being Lepidostrobus. Lepidostrobus had an axis similar anatomically to a vegetative twig and bore numerous spirally arranged sporophylls each bearing a single, very large radially elongated sporangium on its adaxial surface. The sporophyll had an upturned blade and these formed an imbricated protective surface. Between the sporangium and the blade a ligule was present. It seems probable that the Lepidodendrons were always heterosporous, the two kinds of spores being produced on different parts of the same cone or upon different cones. The microspores were small, tetrahedral in form and very plentiful. The megaspores were relatively very large, few in number, tetrahedral in form, with a hairy surface and commonly opening by apical flaps. The prothallus within the megaspore is occasionally preserved and even archegonia have been recognized. In another cone genus, Spencerites, the sporangia were united to the sporophyll by a distal neck and the spores were winged. In some Lepidodendron cones large masses of sterile tissue are developed within the sporangia suggesting a vestigial sporangiophore and in Mazocarpon the large sausage-shaped megaspores are embedded in a solid parenchymatous tissue.

Still another type of Lepidodendron fructification was Cantheliophorus in which the sporophylls were commonly deciduous. Each sporophyll bore two large sporangia separated by a median sterile plate interpreted as representing the sporangiophore of the ancestral prosphenophyllum stock.

The vast majority of stem impressions represent minor variations of the common Lepidodendron type. In the genus Lepidophloios the bolsters were very prominent and became recumbent in old age so that the normal leaf scar appears to be at the base. The Halonia branches with their spirally stalked deciduous cones appertain particularly to Lepidophloios, which, anatomically was, exactly like Lepidodendron.

The Sigillariaceæ were much like the Lepidodendrons in essential features but different considerably in habit. They attained their maximum development in the Upper Carboniferous and gradually waned during the Permian although they appear to have survived into the

Lower Triassic. The trunks were generally massive and for the most part unbranched, giving them a peculiar appearance and at one time suggesting a relationship with the cycadophytes, since discredited. Stem impressions, which, like those of Lepidodendron, are exceedingly common throughout the Coal Measures, can readily be distinguished by their vertically arranged scars often on prominent ribs, by the slight development of bolsters and by the scars being wider than high with the angles at the sides and rounded above and below. Very many species have been described and the variations observed are very useful for stratigraphic purposes and have resulted in an elaborate analysis of the types of surface ornamentation. These fall naturally into two main groups — the Eusigillariæ with ribbed stems and the Sub-sigillariæ with smooth stems.

The Eusigillariæ show broad longitudinal ribs separated by furrows and are segregated into two subordinate groups, i.e., Favularia, in which the ribs are separated by zigzag furrows and the scars transverse furrows and Rhytidolepis, in which the ribs are separated by straight furrows and are often much broader than the close set or spaced scars. Where the furrows are broad and intercalated narrow ribs without leaf scars are developed the forms are sometimes set apart under the name Polleriana, and when transverse furrows appear the forms are grouped under the name Tasselata.

Various stages of preservation yield characteristic surface features thought to indicate distinct genera by the older student but useful now as descriptive terms. Thus when partially decorticated the inwardly enlarging strands of aerochyma result in vertical rows of pairs of large mammilæ and such stems have been called *Syringodendron*. Petrified material of Sigillaria is rarely found. The pith was very large and the vascular cylinder thin and sometimes broken up into separate bundles. Tracheids reticulate or scalariform increasing in size centripetally. Secondary wood consisting of radially arranged scalariform and pitted tracheids, centrifugal in development with narrow medullary rays. Cortex was thick with an inner soft zone and an outer mechanical zone as in Lepidodendraceæ. The leaftraces had an inner centripetal primary strand surrounded by a centrifugal secondary zone. The leaves are much like those of Lepidodendron with a central concentric vascular strand surrounded by a considerable development of transfusion tissue. In some instances the strand is double. The cuticle was dense and the stomata were confined to the two furrows on the lower side which were clothed with multicellular hairs.

The cones of Sigillaria, usually going by the name of Sigillariostrobus, are common as impressions, but are practically unknown in a petrified condition. They were often very large, being as much as five or six centimeters in diameter in *S. nobilis*. They agree in having long peduncles covered with needle-like bracts. The fertile part bears crowded sporophylls of somewhat variable shape with flexed and imbricated distal blades. The sporangia were sometimes attached for nearly their whole length to the adaxial face of the sporophyll while in other cases they are thought to have been attached distally. Some cones are known to have been heterosporous and this was probably the rule throughout the family. It was formerly thought that both the Lepidodendraceæ and Sigillariaceæ became extinct with the Paleozoic but cones considered to be related to the Lepidodendraceæ and named Lycostrobus are recorded from the Upper Triassic (Rhætic) of Sweden, and certain remains from the Lower Triassic (Bunter) of Europe, known as Pleuromeia and sometimes made the type on a separate family, are now believed to represent the Sigillariaceæ. Pleuromeia, which is imperfectly known, is represented by stem casts of simple stems 9 to 10 centimeters in diameter, the surface covered with remote rhomboidal, Clathraria-like, leaf-scars. Basally the stem separates into four lobes suggestive of Stigmaria or Isoetes and covered with rootlet scars like those of Stigmaria. Poorly preserved terminal cones of crowded imbricated sporophylls are also known. The form of the stem and the growth separation of the leaf scars indicates secondary thickening; decorticated specimens resemble Knorria; and the thin central cylinder all point to a close affinity with the true Sigillarias. The cone genus Poecilitostachys from the Triassic of France also indicate a third surviving type of the Lepidodendrales.

There remain for consideration two examples which indicate that some of the Lepidophytes had definitely progressed beyond hetrospory to what amounts to the acquisition of the seed habit. The first of these, Lepidocarpon, comes from the Lower Coal Measure of England. The cone was of the Lepidostrobus type in all its immature details. Only a single megaspore reached maturity in each sporangium practically filling the whole cavity, and as it matured it was enclosed with a complete investment (integument or velum) which grew up from the adaxial surface of the sporophyll and open by only a narrow apical micropylar slit. At maturity the whole sporophyll with its integumented megasporangium was shed as a closed seedlike reproductive body.

The second spermophytic Lepidophyte type, known as Miadesmia and coming from the Lower Coal Measure of England, was borne on a slender herbaceous form. Each sporophyll bore a ligule like those of the vegetative leaves and had a fringed lamina. The megasporangium was attached to the proximal adaxial face of the sporophyll and developed a single magaspore which filled its cavity, and was enclosed in an integument arising from the proximal region of the sporophyll which completely invested the megasporangium except for a circular micropylar opening at the beaklike distal apex of the sporangium. The microphyle was surrounded by numerous integumental hairs or tentacles which probably facilitated fertilization. Some megaspores are filled with prothallus. The whole sporophyll was shed at maturity. In some respects Miadesmia was more advanced than Lepidocarpon and while neither are morphologically homologous with the seeds of the other spermophytes, they are physiologically true seeds which apparently did not evolve further along lines leading to higher plants as did the seeds of the Pteridospermophytes.

It cannot be said that there is any unanimity of opinion regarding the phylogenetic position of the Lepidophyta. Some students regard their origin as entirely independent of the Arthrophyta while others regard them as probably distantly related to the pro-Sphenophyllum stock that represented the Arthrophyte ancestral line. At the other end of the phylum there are students (Seward, Potonié) who considered that the Araucariales and perhaps the balance of the Coniferophytes diverged from the Lepidophyte stock, while others justly doubt that the phylum had any higher issue.

The view advocated here, an opinion frequently advanced, is that the Lepidophyta represent a group of forms derived by reduction from more megaphyllous ancestors, and that the prevailingly simple relationship between the sporangia and the sporophylls is due to simplification or reduction from sporangiophoric ancestors closely related to the theoretical pro-Sphenophyllum type. This view is based in part on a consideration of the paired sporangia of Cantheliophorus with their central sporangiaphoric plates, on the ventral pad of Spencerites, the core of sterile tissue in Mazocarpon, the sterile plates in various Lepidostrobus sporangia and the stalked sporangia of the modern Psilotales. A consideration of the details of morphology and the fossil record, too extensive a subject for presentation in the present brief review, leads to the conclusion that the Lepidophytes are not related to any of the higher seed plants and never gave rise to more highly organized types.

Pteridospermophyta.— The recognition and partial elucidation of the seedferns of the Paleozoic is one of the outstanding paleobotanical achievements of the last decade. It is needless to dwell on the immense advantages which seed-bearing confers on the plants which have acquired this habit. The mere fact that seed plants are the dominant existing plants is sufficient proof of this. Over a generation ago Stur suggested that the fronds of Neuropteris, Alethopteris and others form genera of fernlike fronds exceedingly common in the Paleozoic, were probably related to the cycads since they were never found in a fruiting condition like normal ferns. Subsequently the anatomy of certain petrified stems showing a combination of fern and cycad characters led to the proposal of a group, the Cycadofilicales, for these intermediate types. Meanwhile the structure of a considerable number of Paleozoic seeds suggestive of cycads, ginkgos and gnetales had been described, but beyond correlating some of them with Cordaites little was known of the plant which bore the majority. In 1903 Oliver and Scott succeeded in proving that certain seeds (Lagenostoma) were borne on fronds of the Sphenopteris type and these in turn were attached to stems known as Lyginodendron. This discovery stimulated an interest in the subject and a succession of discoveries followed so that enough is now known to warrant considering a large number of the supposed Paleozoic ferns as Pteridosperms or seed ferns. The manifestly primitive characters show in one feature or another, such as the more or less free nucellus, the complex vascular supply of the seeds, their total lack of an embryo, the fact that both megasporangia and microsporangia were borne upon but slightly modified foliage leaves of decompound fernlike fronds, and various recondite histological characters, justify regarding the seed ferns as representing a distinct phylum — the Pteridospermophyta. They were gymnospermous in habit and some students regard them as a subordinate class of gymnosperms — a taxonomic term that has outlived its usefulness for other than descriptive purposes.

The Pteridospermophyta may be tentatively characterized as plants with the habit and to a large extent the anatomical features of ferns, but differing in producing integumented megasporangia or seeds borne on the usually but slightly modified fernlike foliage and never aggregated into true strobili, having secondary thickening in both stems and roots.

From the rapidly increasing contributions to the knowledge of the Pteridosperms it will suffice to describe a few of the better known forms. Among these the best known is Lyginodendron, or Lyginopteris as it is more properly called. Lyginopteris represents a group of species with slender, scrambling, mostly unbranched, stems of considerable length bearing large forked decompound fronds upward of a metre in length and long known under the name of *Sphenopteris Hœninghausi*, whose persistent petioles (Rachiopteris) were almost as large as the main stem on which they were arranged in a two-fifth spiral. The roots (Kaloxylon) were partly adventitious. The stem cortex was fibrous and reticulate and was clothed with spines and capitate glandular hairs. The seeds (Lagenostoma) were borne in lobate cupules, while the pollen was on the other and more reduced fronds in rosettes of six or seven fusiform bilocular sporangia (Crossotheca).

Lyginopteris was monostelic with a large pith containing sclerotic tissue. Primary wood of five to nine collateral strands. In all but the most immature stems there is a broad zone of secondary wood of pitted tracheids and medullary rays. The cambium was persistent and is sometimes petrified, as is the phloem. The cortex comprises a thin periderm and an inner poorly preserved soft cortex and an outer cortex characterized by radial bands of fibrous tissue. Leaftraces mesarch and double. Anomalous features are the occasional formation of inverted secondary wood by the intrusion of the cambrium through a foliar gap.

The seeds, five or six millimeters in length, were borne in a lobed cupule and were orthotropous and radially symmetrical, with a single integument confluent with the nucellus except distad. The free part forms a plug and the pollen chamber was hence reduced to a conical slit. The integument was supplied by nine vascular strands which ran to the apex which formed a fluted dome or radially septate canopy at the apex of the barrel-shaped seed.

The microsporangia were found in connection with vegetable fronds and are of a type known as Crossotheca. Other types of microsporangia may well have been present in different species of Lyginopteris, as for example those called Telangium, in which the sporangia are concresent proximad. A second genus of seed ferns which is fairly well known is Heterangium which had long slender angular stems with large and graceful forked (*Sphenopteris elegans* Brongn.) fronds arranged in a three-eighths spiral. While the evidence is less conclusive than in Lyginopteris there are good reasons for considering the seeds known as Sphaerostoma as those of Heterangium. Heterangium had a monostelic stem like Lyginopteris but the pith was replaced by mesarch primary wood as in some recent ferns. The secondary zone was thin. The seeds (Sphaerostoma) are small with an inner integument and an outer integument or cupule, both with an elaborated vascular supply. The free apical part of the nucellus is a relatively flat plinth surmounted by a central dome or lagenostome which is surrounded by an annular pollen chamber. The free apical part of the integument formed a frill or canopy with eight radial crests around the micropyle. Heterangium had a greater range than Lyginopteris being found from the Lower Carboniferous to the Permain. Seeds of Lyginopteris or Heterangium are found in the French coal measures associated with the frond genera *Sphenopteris elegans, S. dissecta* and *S. obtusiloba.*

A second family type to which at least four genera are referable is the Medullosaceæ. These are characterized by the enormous development of the fronds of the Neuropteris and Alethopteris type with petioles several centimeters in diameter. This enormous display of foliage is doubtless to be correlated with the peculiarities in the anatomy of the stems. The most primitive known genus, one indicating the point of departure of the other and more specialized members of the family, is Sutcliffia of the English Lower Coal Measures.

Sutcliffia had a large pithless central stele of centripetally formed wood from which meristeles branch and divide and fuse irregularly and eventually give rise to leaftraces, a large number of which enter each petiole where their structure is concentric. Secondary wood is but feebly developed. The next stage in the evolution of these forms away from the Heterangium type is furnished by *Medullosa anglica* which is polystelic with normally three steles, each developing secondary wood. The stems were as much as seven or eight centimeters in diameter and bore spirally arranged decompound fronds with decurrent petioles. Many adventitious roots were formed.

Without stopping to dwell on the histological details we pass to the exceedingly complex Medullosas of the Permian in which the steles become very numerous and are differentiated into inner «star rings» and outer «plate rings» systems, the latter forming a peripheral zone which is an almost closed woody cylinder. Successive extrafascicular zones of wood and bast were developed in several species. The leaf traces which are at first concentric break up into strands with external protoxylem, several from different levels of origin entering each petiole. The peculiar arrangement in these later Medullosas is a necessary outcome of large polystelic stems with secondary thickening and appears to have constituted a rather impractical experiment in attempting to develop secondary thickening around numerous steles in a single stem. If the theory advocated by Worsdell, Chodat and others is substantiated it would appear that certain of the Permian Medullosas solved this problem in the mechanics of stem structure by suppressing the centripetal portions of the steles while the centrifugal and continuous portions characterized forms which passed by gradations into the Cycadophytes. Scott and Solmslaubach on the other hand regard the Medullosaceæ as a highly differentiated derivative of a Heterangium-like ancestor which became so specialized that it became extinct during the Permian.

Other genera that appear to belong to this family are Colpoxylon, Rhexoxylon and possibly Steloxylon, all based upon fragments of petrified stems from the Paleozoic of Europe, Africa and Asia.

Medullosa petioles are referred to the genus Myeloxylon and structural material has been described from both Europe and America. The foliage of Medullosa was of the frond types known as Neuropteris, Alethopteris and Linopteris all of which were exceedingly abundant and cosmopolitan in the later Paleozoic floras. Impressions from the Scotch Carboniferous show large Rhabdocarpus seeds attached to the fronds of *Neuropteris heterophylla* and similar but still larger seeds attached to Belgian specimens of *Neuropteris obliqua.*

The microsporangia appears to have been four valved and terminal on naked pedicels in *N. heterophylla* or marginal on orbicular or cuneate pinnules as in Potoniea, *N. gigantea* and *N. Carpentieri.* Although no seeds have been found in actual connection with alethopteris there are good reasons for believing that some species at least (e.g., *A. lonchitica, A. serlii*) bore seeds of the Trigonocarpus type. The latter, which are often exceedingly common as impressions and casts, as described from petrified material are elongate-oval radially symmetrical. The testa is thick and consists of an outer flesh (sarcotesta), a shell (sclerotesta) and an inner flesh. The shell has three longitudinal ribs which characterize the seeds when preserved as casts after the decay of the outer flesh. Less prominent lines are intercalated between the main ribs. There was a long triangular micropylar canal leading to a small pollen chamber in the apex of the nucellus and the latter is free to the base.

Other genera that may represent sporangia of different types of Medullosaceæ are Codonotheca, Schützia, Whittleseya, Dolorophyllum and Ottokaria (?).

The bulk of the remaining types which are referred to the Pteridospermophyta are based upon anatomical studies of stem or petiole fragments ranging in age from the Devonian (Kalymma) to the Permian and will not be described in the present connection. In addition to these, several types of fronds formerly referred to the ferns have been proven to be seedbearing. Thus fronds referred to *Pecopteris Pluckeneti* but probably representing *P. sterzeli,* had slightly reduced pinnules bearing terminal oval seeds with a thick sarcotesta giving the impressions the appearance of having narrow wings. This discovery is of special interest since typical Pecopteris fronds have been shown to have constituted the foliage of Psaronius (an undoubted fern) and they frequently show fern fructification of the Asterotheca or Scolecopteris type. A second fern, *Aneimites fertilis,* from the Appalachian Pottsville had small bilaterally symmetrical seeds on the somewhat reduced pinnules, the fleshy sarcotesta giving the impressions the appearance of having narrow wings. Other associations of seeds and fronds not found in organic union are the frond species *Eremopteris artemisæfolia* and the seeds *Samaropsis acuta,* the frond species *Aneimites bellidulus,* and the seeds *Lagenospermum Arberi.*

It has been suggested that the Gondwana genera Glossopteris and Gangamopteris were Pteriosperms, but there is as yet no basis for this view. The peculiar Permian frond genus of Asia and North America known as Gigantopteris is found in constant association in the latter country with flat cordiform alate seeds borne in the concavity of an abovate reduced pinnule with the Gigantopteris venation and associated with these are detached two ranked strobiloid organs consisting of similar bract like pinnules bearing small oval pendant microsporangia — not true cones but definitely more strobiloid than any demonstrated Pteridospermophyta.

It is evident that the Pteridospermophyta constituted a large and varied plexus of synthetic seed plants our knowledge of which is too imperfect to warrant an extended discusson of their phylogenetic relations. That they were descended from the ferns is obvious, but whether from the more complex Cœnopteridæ (e.g., Asterochlæna) through the polystelic Medullosaceæ or from a simple protostelic form of Botryopteraceæ through Lyginopteris is debatable. They seem to show an as yet undemonstrative relationship with the Paleozoic Marattiaceæ. Within the phylum Scott regards them as showing two lines of descent, one through the evolution of a single stele and leading in the direction of the Cycadophytes and the other toward polystely which eventually became extinct. Chodat on the other hand regards Lyginopteris as a true fern with specialized megasporangia without higher issue, while he considers the Medullosaceæ as the ancestors of the Cycadophyta.

Whatever the details of descent the Pteridospermophyta in some of their forms undoubtedly stand in an ancestral relationship to the Cycadophytes and they may well have merged in their earlier manifestations with the same stock that gave rise to the Cordaitales and Ginkgoales.

Cycadophyta.— No existing group of plants has excited more interest in recent years than the existing cycads (order Cycadales). Before the peculiarly organized Mesozoic forms were understood, the wealth of foliar impressions of cycad-like fronds in the Mesozoic rocks throughout the world and similar less abundant remains in the later Paleozoic, led to the conclusion that the cycad line was simply another example of an ancient, persistent, rather uniform, stock derived from the ferns, whose existing representatives were the straggling survivors of a type which attained its maximum development in the older Mesozoic. The researches of Carruthers, Solms, Laubach, Nathorst, Lignier and Wieland have shown that the group was large and diversified and includes at least two extinct orders very different from the existing cycads; that its origin is to be looked for among the seed ferns rather than the true ferns; and that existing cycads represent relatively modern and never very abundant derivatives of this ancient stock.

In sketching the morphology of the Cycadophytes the reader has to bear in mind that we are dealing with an extensive group that appeared in the record as early as the Carboniferous (Westphalian) and continued to the present, and that aside from the recent forms and a few exceptional fossil forms like the Rhætic Wielandiella and the Lower Cretaceous Cycadeoids and Williamsonias, we have only the remains of foliage as a clue to relationships and practically no information regarding anatomy or fructifications; the latter we infer from the analogy of known forms were highly variable. As sketched in the following paragraphs the Cycadophyta are somewhat arbitrarily segregated into three subordinate groups — the aberrant Cycadeoidales, which are not as far removed from the second group, the Mesozoic and existing Cycadales. The third group, for which the inappropriate name Williamsoniales is retained, includes the balance of the Cycadophytes. It is not a compact group and the progress of discovery will doubtless show it to be unnatural. In its beginnings it approximates the Pteridospermophyta and also shows points of possible contact with the Gnetales and Ginkgoales. In its more evolved members (e.g., Williamsonia) it approximates the Cycadeoids to such an extent that Wieland and other authorities group the former and the latter together. The two points of view are entirely in agreement regarding the facts and differ merely in the placing of the boundary between the two groups — a not very serious difference in an evolving series of forms.

The Cycadeoidales appear to represent an evolution from the older Williamsoniales stock and according to our present knowledge they are confined to the Jurassic and Lower Cretaceous. Their prevailingly tuberous trunks are individually abundant in a silicified condition in certain sandy strata of those ages, particularly in the Portland Dirt Bed of the Isle of Wight, the Patuxent formation of Maryland and the Morrison beds of the Freezeout Hills in Wyoming. By far the largest number have been found in the similar strata of the Dakota formation, which outcrops in the Black Hills rim. Similar remains in less abundance have been found in France, Italy, Galicia and elsewhere. Their wonderful preservation and exceptional morphological features have resulted in unusually painstaking researches which have shown that the group as a whole was one of rather limited variation and stereotyped organization, relatively no more abundant in Jurassic and Lower Cretaceous time than are the Cycads in existing floras. The salient features briefly enumerated are a tuberous or short columnar stem, sometimes an aggregate of tuberous stems, as in some species of Encephalartos. The stem was encased in a heavy armor of persistent leaf bases, which largely obviated the necessity for the development of a thick zone of mechanical woody tissue in the stem. The interstices of leaf bases were filled with multicellular scales (unicellular hairs in the Liassic *C. Micromyela* Morière) corresponding to the ramentum of ferns, in some cases (as in the genus Cycadella) very long and enclosing the whole trunk in a felt-like mass. This ramental covering appears to have facilitated their subsequent silicification, so that normally the fossil trunks show the ramental areas as prominent partitions, separating the subrhombic angular cavities left by the leaf stalks which had decayed or were shed before fossilization. Among the leaf bases occur numerous short axillary branches each terminated by a solitary fructification or flower. The anatomy of the stem is much like that of the cycads. There is a thick cortex, a comparatively thin vascular cylinder and a very large pith containing secretory sacs rather than gum canals. The vascular bundles are collateral, the protoxylem is next the pith (endarch) and the few spiral marked tracheids are soon replaced by scalariform tracheids which appear to characterize the phylum, although pitted tracheids are recorded in *Cycadeoidea micromyela.* In the leaves, however, the structure is mesarch, suggesting their pteridophytic ancestry. The leaf traces are single and direct and thus more simple in their arrangement than in existing cycads.

The axillary branches bear reduced leaves or bracts spirally arranged and are of a length to bring the terminal flower at about the general level formed by the persistent leaf bases. The branch axis expands into a subhemispherical or conical receptacle. At its base and immediately beyond the enclosing bracts was inserted a whorl of compound microsporophylls, united into a continuous sheath proximad, expanding distad into a bipinnate frond with alternate pinnæ, all of which, except the apical and basal pairs, bearing two rows of synangia, suggesting those of a marattiaceous fern, the whole greatly resembling a. fertile fern frond rather than a verticil of stamens, and like the former circinate in vernation. The surface of the receptacle above the staminate collar is beset with slender pedicels each bearing at its extremity a single orthotropous seed, the interspaces packed with sterile appendages known as interseminal scales, which expand apically so that only the micropylar part of the seed reaches the surface and the whole is compact and simulates a closed pericarp. The whole fruit-like body is ovoid or turbinate in shape, several centimeters in length, the surface a mosaic of the expanded tips of the interseminal scales, between which the micropylar tubes of the seeds protrude. The microsporophylls are only preserved in immature strobili. They have disappeared at a later period but their former presence can usually be inferred from the basal shoulder that marks their insertion on the receptacle. The probabilities are that all the cycadeoids were bisporangiate, although this is disputed in the case of some species. The seeds are very small as compared with those of living cycades and have a two or three layered testa, prolonged upward into a micropylar tube the outer palisade layer of which at the shoulder where it joins the seed being expanded by radical extensions forming five or six radial wings. The cavity of the seed is completely filled by a large dicotyledonous embryo which in its developments, unlike any living gymnosperms, destroys all of the endosperm.

A variety of cycadfronds are found in the deposits which have yielded the petrified trunks, but our information regarding their actual foliage is furnished by small unexpanded petrified material which show pinnate fronds of the Zamia type, circinate in veination with erect pinnules. It seems probable from the large number of cones in the same stage of development in some trunks and their complete absence in other large trunks, that seed formation was the culminating event of many seasons of vegetational activity, possibly occurring but once at the maturity of the plant, but more probably repeated at increasing intervals throughout life.

Fronds indistinguishable from those of cycadeoids are cosmopolitan from the Triassic to the Upper Cretaceous, but there is no means for determining to what an extent they belong to the cycadeoids and the probabilities are strongly in favor of considering most of them as the fronds of the order that I have termed the Williamsoniales. The Williamsoniales comprise a much more protean and long-lived group of forms, unfortunately known almost entirely from impressions. They appear in the later Paleozoic in the genera Plagiozamites, Pterophyllum and Sphenozamites, are very prominent in the Triassic, Jurassic and Lower Cretaceous and are still present but in reduced numbers in the Upper Cretaceous after the cycadeoids had become extinct. The nature of their remains precludes a concise summary of their features. Both the very abundant foliar remains as well as such fructifications as have been preserved indicate a much wider variability than among the other two orders of cycadophytes. The sole feature that at present can be considered as probably characteristic of the order is the relative slenderness and elongation of the stem and the frequency with which it branched, often dichotomously. It is not possible to consider the various foliar types in the limits of the present paper, a subject requiring much study and never adequately discussed and only a few of the more representative types will be mentioned. Among these one of the most remarkable is the genus Wielandiella from the Rhaetic of Sweden. Wielandiella had an elongated slender stem not over two centimeters in diameter, with repeated dichotomies, prevailingly naked except in the region of the forks where it bore spirally arranged rather reduced fronds of the Nilssonia or Anomozamites type. In each fork was a subsessile fructification surrounded by bracts. These fructifications are met with in two forms, probably representing different ages and states of preservation. In the one it consists of a small pyriform axis separated from the peduncle by a swollen striated collar bearing oval microspores on the surface of greatly reduced scale-like sporophylls. Ovulate structures on the pyriform axis appear to have been vestigial. In the second type the axis is hidden by the linear bracts but its surface reveals a regular pattern of interseminal scales between which the micropylar tubes project, indicating an ovulate organization like that of the cycadeoids and Williamsonia.

Another old genus is the Rhaetic genus Cycadocephalus, also from Sweden and based on impressions of a large fructification 10 centimeters long and seven centimeters in diameter. The peduncle is slender and shows no leaf or bract scars. No trace of a central ovulate receptable is discernible, the head consisting of a cluster of linear microsporophylls with a keel-like midrib on their inner faces and bearing on either side of this midrib linear pointed synangia.

A third Rhaetic genus is Weltrichia from Franconia, based upon a funicular fructification, the cup of which was formed by the concrescent bases of about a score of broadly linear microsporophylls, the whole 10 centimeters in length and nine centimeters in diameter. The free lanceolate apical portions of these bear linear appendages five to eight millimeters long attached to their inner faces, comparable with the synangia of Cycadocephalus. No traces of ovulate structures are known, so it cannot be determined whether either Cycadocephalus or Weltrichia were unisexual or bisexual.

As previously mentioned, a variety of frond genera of late Triassic, Jurassic and Lower Cretaceous ages are found from Japan and New Zealand on the east to California and Alaska on the west, and from Franz Josef Land, Spitzbergen and Greenland on the north to Graham Land on the south. No continent is without an abundant representation. Associated with these frond genera at many localities, particularly in India, England and southern Mexico, are the objects commonly referred to the genus Williamsonia.

The most celebrated of these is perhaps *Williamsonia gigas*, discovered early in the last century in the Jurassic outcrops along the Yorkshire coast, and the basis for Williamson's historic restoration. These have been found in organic union with foliage and stems. The stems (Bucklandia) were slender, five centimeters in diameter, covered with rhomboidal leaf scars, with a crown of Zami-like fronds about two feet long, and bearing at the summit slender peduncles 20 to 30 centimeters long, covered with spirally arranged scale leaves and terminated with an ovulate receptacle bearing pedicillate seeds similar to those of Cycadeoidea, surrounded by bracts or sterile sporophylls united proximad to form a disc or cup. No trace of microsporophylls are certainly known in this species, although the probabilities are that it was bisporangiate, in fact certain staminate discs have been referred to this species by various students.

Naturally a very large number of different species of Williamsonia have been described from a variety of Mesozoic horizons and localities, but few of these show essential features or have been exhaustively investigated. A very characteristic form (*W. virginiensis*) occurs in the Lower Cretaceous of Virginia and another in the Upper Cretaceous of Delaware.

Among the better known forms are *W. spectabilis*, from the Yorkshire Jurassic, which shows a funicular disc prolonged into linear lanceolate microsporophylls bearing on their inner faces fertile pinnæ carrying reniform synangia. A central ovulate receptacle is wanting. *W. whitbiensis*, also from the Yorkshire Jurassic, is similar to the preceding, but the fertile pinnæ are reduced and the reniform synangia are borne on either side of the midrib along the inner face of the free part of the microsporophylls.

Still another type is *W. mexicana*, from the Lias of Southern Mexico, in which the cup is deeply campanulate with 10 short, narrow, free lobes bearing two rows of lateral synangia.

The only petrified Williamsonia known is the imperfectly preserved *W. Scotica*, from the Jurassic of Scotland, which shows hairy bracts, no traces of microsporophylls and a central receptacle consisting of interseminal scales and pedicellate seeds exactly similar to Cycadeoidea.

An interesting and more reduced type, whose affinities indicate the survival to the middle Jurassic of the Wielandiella type, is one made the basis of the genus Williamsoniella. If the various parts are correctly correlated they show slender frequently dichotomous stems bearing scattered leaf scars and believed to have borne the associated type of foliage known as *Taeniopteris vittata*. In the stem forks are pedunculate bracteate fructifications consisting of a whorl of cuneate microsporophylls, bearing five to six sessile reniform synangia on either side of the inner keel. Within the whorl of microsporophylls a pyriform receptacle with a sterile crown is covered with small interseminal scales and short stalked seeds like those of Williamsonia and Cycadeoidea.

Remarkably well-preserved fronds from Greenland and elsewhere described as Cycadites have recently been shown to possess a double midrib separated by a stomatal groove, and these forms have consequently been made the basis for a new genus, Pseudocycas, although nothing is known of the plants which bore these anomalous fronds.

A frond genus that deserves mention is Podozamites to which a very large number of often detached pinnules have been referred, some of which are with difficulty distinguished from the coniferophyte genera Nageiopsis, Araucaria, etc. These are widespread and more or less abundant from the Triassic to the Upper Cretaceous. In the more perfect specimens Podozamites shows a slender rachis with somewhat irregularly spaced parallel veined lanceolate pinnules, often deciduous. Podozamites may well be composite. In certain species the pinnules appear to be borne on definite short shoots, and the associated fructifications (Cycadocarpidium) consist of loose cones of sporophylls much like the vegetative leaves and bearing proximad ovules with pointed wing-like appendages. Podozamites in some of its forms may thus constitute a point of contact between the cycadophytes and coniferophytes or it may really belong with the latter phylum and have no cycadean relationship.

The Cycadales have tuberous or columnar, sometimes subterranean, sparingly or not at all branched, stems, covered with persistent leaf bases, bearing a crown of large compound leaves and apparently terminal diœcious strobilæ (truly lateral). The cortex is thick, the vascular cylinder thin and the pith large. Bundles are collateral and endarch in the stem, but often misarch and even concentric in the leaf traces and strobilar axes. The leaf traces girdle the stem, entering leaves on the opposite side from which they separate from the vascular cylinder.

The existing cycads constitute a rather compact group of nine genera and about 110 species indigenous in the warmer regions of both hemispheres — Cycas, with some 16 Oriental species, and Zamia with about 30 occidental species being the dominant genera. Besides Zamia the genera Miscrocycas, Dion and Ceratozamia are American; Encephalartos and Stangeria are African, while Cycas, Macrozamia and Bowenia are Asiatic or Australian. In individual abundance they do not play a leading rôle in any forest assemblage, although the small *Stangeria paradoxa* forms thickets in southeastern Africa and *Macrozamia spiralis* forms a scrub over considerable areas in eastern Australia. For trunk-forming plants they are inconspicuous and vary from the dwarf Zamias with underground stems or epiphytic forms to some of the species of Cycas which reach a height of 20 metres and live to a great age.

The Cycadales and presumably the majority of the fossil cycadophytes send down a primary root which continues as a tap root, often approaching the trunk in size. All the forms have compound leaves. The leaves are in whorls crowning the stem or the branches in branched forms, giving a strikingly handsome appearance. Each whorl alternates with a whorl of scale leaves. The whorl may consist of but a few to over 100 fronds, varying in size from a length of 10 centimeters to more than three meters, and the fronds may have but a few to as many as 250 pinnules. The structure is xerophytic and the pinnules generally have entire margins. They vary from lanceolate to linear and acicular. In some Zamias and Stangeria the margins are serrate. In Dion they are thorny and in Encephalartos they are inequilaterally lacerate.

A feature reminiscent of ancient habits and shared only by Ginkgo among existing seed plants is the fertilization of the egg cells by multiciliated swimming sperm cells.

The histological and morphological details of the Cycadales belong to modern rather than paleobotany and need not be dwelt upon in this connection.

Both the staminate and ovulate sporophylls are always aggregated in strobili, which are compact and rather uniform throughout the order, except that in Cycas the ovulate strobilus instead of being compacted in a cone consists of rosettes of sporophylls resembling reduced foliage leaves in which ovules replace the lower pinnæ or teeth.

The fossil record of the Cycadales is extremely meagre. It includes certain not conclusively determined ovulate cones from the Keuper of Switzerland, resembling those of Zamia; and more convincing carpellary leaves, like those of the modern Cycas, from the top of the French Triassic (*Cycadospadix hennocquei*), from the Kimeridgian of Italy and Scotland (*Cycadospadix pasianianus*) and from the Rhaetic of Sweden (*Cycadospadix integer*), which demonstrate the presence of true Cycadales in the late Triassic and Jurassic. The Cretaceous records are few and not especially trustworthy. During the Tertiary a few undoubted remains of cycads occur at scattered localities, demonstrating a more extended geographical range than obtains at present. Thus there are two species of Zamia in the lower Eocene along the shores of the Mississippi embayment. A third species occurs in the basal Eocene of Belgium and a fourth in the late Oligocene or lower Miocene of Chile. Oligocene species include a Zamia from France, an Encephalartos from Greece and a not certainly identified Ceratozamia from northern Italy. The Miocene records include a Zamites and a Cycadites from Switzerland.

Coniferophyta.— The Coniferophyta corresponds almost exactly to the Gymnospermæ of the older students. Their outstanding characteristic is the exposed ovules discovered by Robert Brown in 1827. This feature has ceased to be diagnostic since it is common to the Pteriodspermophyta and Cycadophyta, and is evidently of ancient lineage. Although probably more continuously and abundantly represented in the geological record than any other group of plants, it cannot be said that our knowledge of either the comparative morphology or the geological history of the phylum warrants a dogmatic view of their phylogeny.

All the known comferophytes are woody plants with pronounced secondary growth; nearly all are trees and it is extremely doubtful if the group ever contained herbaceous forms. They show rather uniform xerophytic structure, due possibly to the character of the water-conducting tissues or to the evergreen foliage, since of the existing species only the bald cypress, ginkgo, the larch and Glyptostrous are deciduous. They usually cannot compete successfully with angiosperms under genial conditions. Structurally the bundles are collateral and a primary persistent cambium develops all of the secondary tissues. The water-conducting tissues are tracheids with bordered pits, and true vessels are found only in the Gnetales. Both mega and microspores are normally formed in cones (strobili), which are never bisporangiate.

The Araucariales and Taxales are diœcious while the Coniferales, Cordaitales and Ginkgoales are monœcious. The sporophylls follow the leaf arrangement and are hence spiral or cyclic. The staminate cones have two or more sporangia to the sporophyll, hence these are less numerous than in the Cycadophytes. They are exceedingly variable and very characteristic for genera. The ovulate cones are varied and their morphological interpretation has been warmly debated for a century. A digest of the various opinions advanced is given by Worsdell (Annals of Botany, Vol. 18, p. 57, 1904). Pollination is effected through the agency of the wind (anemophily). The stock is of great antiquity and contemporaneous groups are to be regarded as divergent or convergent and not directly filiated. It has been demonstrated beyond reasonable doubt that the Cordaitales, Ginkgoales and Cycadophytes are alike related to the Pteridosperms and Ferns. In the case of the Coniferales and Araucariales this is not so certain and some students (Renault, Campbell, Potonié, Seward) consider the later groups as of Lepidophytic origin. The most interesting order from an evolutionary standpoint — the Gnetales — since they seem to form a connecting link with the amentiferous Dicotyledonæ have an ancestry completely unknown, although they show certain structural and developmental points of contact with the Cordaitales, Ginkgoes and Cycadophytes.

In the present treatment the coniferophytes are grouped in six orders — Cordaitales, Ginkgoals, Taxales, Araucariales, Coniferales (Pinales) and Gnetales which are best discussed separately. The oldest of these orders, long since extinct, is the Cordaitales. The Cordaitales were exceedingly abundant and presumably varied at several horizons in the Paleozoic, and the synthesis of a study of impressions of their foliage and fructification, pith casts and petrifactions enables us to draw a satisfactory picture of their general appearance and habit, although as yet it is usually impossible to correlate specific foliar impressions with petrified stems and seeds. They were tall and relatively slender trees with trunks that were frequently over 100 feet in height and unbranched except at the crown where their spirally arranged foliage of simple and often large parallel veined leaves were displayed. Leafform has been used as a basis for the three forms genera — Eucordaites, with spatulate blunt tipped leaves often several inches in width and two or three feet in length; Dorycordaites, with pointed leaves approaching those of Eucordaites in size; and Poacordaites, with narrow linear leaves. The parallel veined leaves unbranched in Poacordaites but repeatedly forked in Dory- and Eucordaites resemble those of corn and the early writers consequently considered Cordaites as a monocotyledon.

The stem has the general features of a modern conifer except for the much larger pith which was often discordal as a consequence of the rapid elongation of the stem, so that casts yield characteristic forms described by the early writers as Artisia or Sternbergia. Structurally, the wood, commonly known as Araucarioxylon or Dadoxylon, was centrifugal with the narrow spiral protoxylem lying at the periphery of the pith, succeeded radially by spiral tracheids soon passing into scalariform elements which after an interval pass into pitted tracheids greatly resembling those of the modern Araucariales. The bordered pits, limited to the radial walls of the tracheids, usually in two or more rows and so densely crowded in alternating series that they tend to be hexagonal in outline. The rays were narrow, originally they may be three cells wide but those of the secondary wood are usually one or at the most two cells wide. The phloem, of sieve tubes, parenchyma and some bast fibres, was like that of modern conifers. The leaf traces were often double as in some Pteridosperms and Ginkgo. The bark was thick but is usually not well preserved. The roots were feebly developed for such large trees, diarch in structure with a broad zone of secondary wood, conforming histologically with that of the stem. The leaf structure is comparable to that of a cycad pinnule with collateral bundles and the stomata were confined to the lower surface.

The fructification shows considerable variation. The catkins, as commonly preserved as impressions under the name of Cordaianthus show an elongated axis with bracteate pedicels bearing the alate bilaterally symmetrical cordate seeds. Petrified material shows the staminate catkins to consist of a thick axis bearing spirally arranged bracts between which the microsporophylls were inserted, either singly or massed near the apex. Each microsporophyll consists of a pedicel surmounted by three or four or more vertically elongated pollen sacs which split longitudinally, and contain large pollen grains which often show a group of prothallial cells. In appearance the ovulate cones are much like the staminate. The axis is thick and clothed with spirally arranged bracts many of which are sterile. In the axis of others are found short stalked ovules with bracteoles. The ovules had two integuments— an outer fleshy one and an inner one which became crustaceous. The ovule shows a nucellus with a large pollen chamber and a beak like micropylar canal. The pollen grains found in the canal and pollen chamber are larger than those in the pollen sacs with their mass of prothallial or antheridial cells more extensively developed and it is hence inferred that the habit of forming pollen tubes had not yet been developed and motile sperms were formed directly.

The seeds of numerous species are common as impressions and have frequently been found in a petrified condition. They exhibit considerable variation in size and form and commonly go under the name of Cordaicarpus.

Several additional types of Cordaitean wood anatomy are known. These include Mesoxylon of which several species have been described from the English Carboniferous, which help bridge the gap between Cordaites and the family Poroxylaceæ of the Carboniferous and Permian. Both Mesoxylon and Poroxylon develop centripetal xylem in the primary wood. A third family the Pityeae, based on large trunks from the Lower Carboniferous of Scotland, is chiefly distinguished by the wide rays. Other anatomical genera in the Cordaitean plexus include Callixylon of the Upper Devonian of Europe and America, Caenoxylon of the Russian Permian, Mesopitys of the Permian, Parapitys of the Middle Carboniferous and Archaeopitys of the Lower Carboniferous of Kentucky. Evidently much remains to be learned before these and other as yet unknown Cordaitean forms can be properly allocated. The Cordaitales show clearly their origin from the same ancient plexus that gave rise to the Pteridosperms. They likewise show points of contact with the later coniferophyte orders especially with the Ginkgoales, Taxales and Araucariales.

Ginkgoales.— The Ginkgoales as a group can be characterized only by the features of the single existing species and these may be misleading when applied to remote ancestral forms. This obvious conclusion must be borne in mind in the attempts to relate these forms to the ancient Cordaitales on the one hand and the modern Abietineae on the other. Thus the formation of pits on the tangential walls of the tracheids at the end of the annual ring is a purely physiological response to an alternation of growth and resting periods and is due to climatic changes, as is the deciduous habit, and it is very probable that neither of these characters was present in early Mesozoic forms or has any phylogenetic significance. Similarly the paired sporangia appear to represent a reduction from the more numerous sporangia of the Mesozoic species.

The modern Ginkgo has a persistent primary cambium, collateral bundles, double leaf trace, no wood parenchyma, resin ducts in both pith and portex, tracheids with radial opposite pits separated by so-called bars of Sanio. The leaves are comparable anatomically with those of cycads but are simple and deciduous. They are borne on either long terminal shoots or in tufts at the apex of short auxiliary shoots — the latter habit shared by some fossil species of Baiera. The pollen is slightly winged and is formed in microsporangia which are normally in pairs, pendant from the expanded tips of sporophylls arranged in loose catkins in the axils of scale leaves at the end of short shoots. The megasporangia are also normally in pairs, although but one ovule matures, and are at the end of a long stalk which is morphologically a shoot and in some Mesozoic species bore more than two ovules. The sperms are ciliated and free swimming as in the Cycadophytes and

Pteridophytes. Ginkgo was formerly considered a member of the family Taxaceae although its resemblance to cycads has long been known. It appears to have been derived from the Paleozoic plexus of Pteridospermophyta, and shows points of contact with both the Paleozoic Cordaitales and the Mesozoic Williamsoniales. All three groups probably had similar ancestors, but there is no evidence that the Ginkgoales have been ancestral to any existing group of Coniferales. The modern Ginkgo is the most isolated as well as the oldest existing arborescent form, its stock being represented in the fossil record continuously from the Permian to the present. The leaves are so characteristic that there is little uncertainty regarding their determination, although some of the older forms referred to the Ginkgoales, simulate such digitate fern fronds as Schizaea, and some of these are of questionable identity. The limited space forbids more than a mention of the extinct genera that have been referred to this order and which in some cases do and in other cases do not belong to this stock. Some of these genera are Ginkgophyllum, Saportaea, Trichopitys, Dicranophyllum, Rhipidopsis, Whittleseya, Psygmophyllum, Gomphostrobus, Trichophyllum, Faildenia, Phœnicopsis and Czekanowskia. Some of these such as Saportaea and Rhipidopsis seem clearly to represent early variants of the Ginkgo type but the two fossil genera that stand out beyond all question are Ginkgo itself and the allied genus Baiera — the latter segregated on account of the short petiole and the repeated dichotomy of the leaf blades to form narrow elongate ultimate segments in which the veins no longer fork. The modern Ginkgo sometimes furnishes instances of more than the usual number of pollen sacs and ovules, and its leaves also frequently become divided to simulate those of Baiera. Both Baiera and Ginkgo appear at least as far back as the Permian and become abundant and varied throughout the Triassic, Jurassic and Lower Cretaceous, where frequently the seeds, immature fruits and the pollen bearing catkins, as well as the leaves, are found fossil. Baiera attains its maximum range somewhat earlier than Ginkgo, and its distribution appears to have extended beyong the known range of Ginkgo in South America, South Africa and New Zealand. It is evidently a waning type during the Upper Cretaceous and becomes entirely extinct before the close of that period. Ginkgo, on the other hand, has been found in the Tertiary of Greenland, North America, Europe and Asia, the characteristic *Ginkgo adiantioides* being abundant and scarcely distinguishable from the still existing species. The latter, long thought to be extinct except as preserved by cultivation in the temple gardens of China and Japan, has recently been reported in a wild state in western China.

Gnetales.— This order includes but three existing genera which differ widely in habit, habitat, anatomy, gametophytic structures and in endosperm and embryo formation, and yet having a thread of common characters denoting their community of origin. Ephedra, with about 30 species of low straggling shrubs with jointed ribbed stems and reduced leaves, inhabits the more arid parts of both the Eastern and Western hemispheres. It is the least specialized of the three genera and more like the Coniferales. Gnetum, with about 26 species of both the Eastern and Western tropics, comprises small trees or woody lianas with opposite, netted veined, dicotyledonous-like leaves, and is most advanced in the direction of the angiosperms. The third genus Tumboa (Welwitschia) is a remarkable monotypic form of western South Africa with a shortened swollen axis and but two, excessively long, parallel veined leaves, and is obviously most specialized (aberrant). All of these modern forms are evidently the end products of an ancient and diversified group which unfortunately has not been certainly recognized in the older fossil floras — Gnetopsis of the Carboniferous (Stephanian) of Europe and North America being, according to Oliver and Salisbury, a pteridosperm related to Conostoma. Gnetum has been definitely recognized in the Pliocene of Holland while several species of Ephedrites have been recorded from the Jurassic, Cretaceous and Tertiary. The relationship of these latter cannot, however, be regarded as established beyond suspicion. Leaves suggestive of Gnetum are also present in the Lower Cretaceous of Virginia.

The point of chief interest in the Gnetales is their angiospermous characters shown in their possession of true vessels (absent in all other gymnosperms, in their broad rays, the presence of companion cells in the bast, the incipient perianth of the infloresence, the floral morphology, the details of sporogenesis, fertilization and embryogeny with the elimination of archegonia, the organization of eggs and the dicotyledonous embryos). Such of these features as were known to the older morphologists suggested that the Gnetales were to be looked upon as representing the progenitors of the flowering plants and this view, which has long been in dispute, has recently come into prominence again and is supported by a considerable body of evidence. Lang and Thompson have shown that the Gnetales are undoubtedly related to the rest of the gymnosperms and are not to be considered true angiosperms, as Lige advocated. On the other hand the attempt to consider them as a reduction series from the Mesozoic Cycadeoidales must be considered an abortive speculation. Some light on their geological history is greatly to be desired since the most recent work with the existing forms indicates an ancient and collateral relationship with the balance of the Coniferophyta going back possibly to the same pteridosperm plexus from which the Cordaitales took their origin. Hence comparisons of the gnetalean flower with the fructifications of existing conifers is obviously futile. In the other direction the least aberrant genus, Gnetum, while in no sense a "missing link," furnishes good grounds for considering an as yet unknown group of gnetalean forms as the ancestors of the angiosperms through the primitive amentiferous families.

Taxales.— The Taxales are diœcious and they differ from all other Coniferophytes except the Ginkgoales and Gnetales in that true cones are not organized, the ovules developing into seeds with a partially fleshy testa (aril) or cupule. Normally only a single ovule of the sporophyll reaches maturity in the modern forms although more seem to have been developed in extinct genera like Palissya.

The Taxales contain but eight of the 36 existing genera of the Coniferophytes and only about 75 of the 325 existing species. At least two and probably three lines of descent are obvious. The first of these is the stock of the family Taxaceae, which is regarded as primitive and a probable offshoot of the Cordaitales by some students, and is considered a modern reduction series by others. Whatever the intricacies of morphological legerdemain it can be positively affirmed that the Taxaceae go back at least as far as the late Triassic and are hence more ancient than the ancestors assigned for them by nonpaleobotanical students. Moreover the disconnected geographical distribution of the 17 existing species is a conclusive indication of an extended geological history, as is the greater geographical range of all of the genera in the past than they attain at the present time. The fossil record, in addition to occasional species of Taxus (Taxites) and Tumion (Torreya) from the Cretaceous to the present, includes the Triassic genus Palaeotaxus, the Lower Cretaceous genus Cephalataxites, the Upper Cretaceous genus Cephalotaxites, Cephalotaxospermum, Vesquia, Taxo-torreya, etc. Cephalotaxus fruits have been found in the Pliocene of Europe and all of the other existing genera appear to have been well represented during Cenezoic times.

That the resemblance of Cephalotaxus to Ginkgo and of Taxus to Cordaianthus, the complex vascular anatomy of the seeds, the absence of resin canals, are not illusory features of the existing species is indicated by the foregoing brief survey of the fossil forms. The second line of descent in the Taxales is represented by the family Podocarpaceæ often made to include two subfamilies, the Podocarpeæ and the Phyllocladoideæ, while some students consider the latter to represent a third evolutionary line.

The Podocarpaceæ are to-day almost as distinctively characteristic of the Southern Hemisphere as the Taxaceæ are of the Northern. They comprise over 50 of the 72 existing species of the order. Podocarpus is easily the dominant genus with over two score existing species and is found in all the southern continents, where they form extensive stands comparable to those of Pinus in the North Temperate zone.

The Phyllocladoideæ are to-day confined to the Australian–New Zealand region, but both subfamilies have an extended geological history. Probably their oldest authentic representative is Palissya (Elatocladus) of the Triassic and Jurassic which had dimorphic foliage and remarkable lax cones made up of flat lanceolate foliar like sporophylls with two rows of small seeds in cupules on their upper (ventral) surface. Palissya, to which 10 or 12 species have been referred, is abundantly represented by sterile twigs in the older Mesozoic of Europe, Asia and America, as well as in the Arctic and Antarctic regions.

Another equally old genus, of great interest but not completely known, is Stachytaxus which has two or three species in the Rhaetic of Sweden and Greenland. It had yewlike leaves and loose cones, each sporophyll of which *bore* a pair of large seeds on their upper (ventral) face, which are compared by their discoverer (Nathorst) with the modern Dacrydium. Podocarpus itself contains about a score of fossil species which appear to have been abundant and rather widespread during the Tertiary and are doubtfully recognized in the Upper Cretaceous. The allied genus Nageiopsis, represented in the modern flora by the Nageia section of Podocarpus with about a dozen broad leafed species ranging from Japan to the East Indies and New Caledonia, is exceedingly abundant in the Lower Cretaceous of North America and is represented in the English Wealden and the Asiatic Neocomian. It has also been recorded from the English Jurassic and the Mesozoic of New Zealand. Phyllocladus occurs throughout the Tertiary of Australia and various supposedly related genera such as Phyllocladites of Spitzbergen and Protophyllocladus of North America and Asia are present in the Upper Cretaceous. Wood known as Phyllocladoxylon has been described from strata as old as the Jurassic.

The difficulty of correctly determining foliar specimens and the lack of structural fossil material of this order leaves much to be desired in the knowledge of the geological history of the order, but such information as is available cannot safely be ignored by weavers of phylogenetic hypotheses.

Araucariales.— The ordinal rank of the Araucariales, first clearly emphasized by Seward and Ford, receives abundant confirmation from a consideration of their organization and geological history. The difficulties of homologizing their morphology with that of the Coniferales or Taxales has led to endless discussion and to the hypothesis, previously mentioned, of regarding them as independently derived from Lepidophytic ancestors. The existing forms, about 15 in number, are segregated into the large-leafed genus Dammara (Agathis) with four or five species of the East Indian — New Zealand region, and Araucaria with 10 or 12 species of South America and the Oriental region. They are diœcious and form large and complex cones in which the morphological distinction of leaf and bract is eliminated. The ovules are solitary and the pollen sacs are free and pendulous. Features of the vascular anatomy made much of by morphological speculators are the persistent leaf traces, the absence of resin canals, bars of Sanio, and wood parenchyma. The tracheids are characterized by crowded alternating and often flattened bordered pits, indistinguishable from those of the Cordaitales. Foliage leaves only are present, there being no traces of the scale leaves so characteristic of the Coniferales. The existence of a variety of Mesozoic genera which combine some of the features of Araucarian vascular anatomy with Abietinaceous characters and the cone and foliar habits of a variety of genera (Widdringtonites, Brachyphyllum, Raritania Thuites, Androvettia, Araucariopitys, Woodworthia, etc.) has led some students to regard the Araucariales as derived by reduction from the Abietiniaceæ, which are usually considered the most modern and specialized coniferophytes. This ingenious hypothesis entirely ignores the geological record, and the cone and foliar habits of the forms, here regarded as the more significant.

For a more exhaustive discussion of this order, see article ARAUCARIALES, as only a summary of the geological history of the order will be given in the following paragraphs. Petrified wood from the Paleozoic cannot be accepted as an indication of the presence of this order since the wood anatomy is practically indistinguishable from that of the Cordaitales, hence the term Araucarioxylon may be of dual significance. The Upper Carboniferous and Permian genus Walchia had foliage like that of the modern acicular leafed Araucaria, bossed pith casts caused by the interlaced sclerenchyma fibres at the periphery of the pith, spirally arranged leaf cushions, Araucarian wood anatomy and single seeded cone scales, and is commonly regarded as an early member of this order, as is also the Carboniferous genus Schizodendron (Tylodendron), and the Permian genera Gomphostrobus and Ulmannia. Permian leafy twigs have been referred to the genus Araucarites and various older Mesozoic genera such as Albertia and Pagiophyllum probably belong in this alliance. Undoubted Araucarian wood and single seed cone scales are cosmopolitan during the Jurassic and continue unabated throughout the Lower and Upper Cretaceous. Dammara foliage and conescales likewise become cosmopolitan during the Upper Cretaceous, and extinct genera such as Pseudoaraucaria, with two-seeded sporophylls, and Protodammara, with three-seeded sporophylls, have also been described. The order appears to have continued its worldwide range well into the Tertiary for unquestionable Araucarian remains of this age have been recorded from the New Siberian islands north of Asia, North and South America, Europe, the East Indies, on the border of Antarctica. Africa then as now is without records. That the Araucariales began to dwindle in the late Tertiary and during the Pleistocene is shown by their absence at those times through the northern hemisphere, their presence on Kerguelen Island and in the Pleistocene of the Falkland Islands and their subfossil occurrence beyond the present range of the existing species.

Coniferales.— The Coniferales as here understood is an order coterminous with the family Pinaceæ of the older botanists and would possibly be more appropriately termed the Pinales. The details of structure and distribution belong more properly to recent botany (see article CONIFERALES), and such as are mentioned in the present connection will be introduced in the brief sketch of the three families into which the order is segregated. These are the Taxodiaceæ, Cupressaceæ and Abietineaceæ.

The family Taxodiaceæ comprises eight existing genera and about 13 existing species characterized by a nearly complete coalescence of bract and scale, wingless pollen and spiral phyllotaxy. The extinct species greatly outnumber the existing and the family has evidently passed its climacteric stage and seems destined to extinction. Moreover none of the genera have more than three existing species (Athrotaxis), three have but two (Sequoia, Taxodium, Glyptostrobus), and four have but one (Sciadopitys, Cunninghamia, Taiwania, Cryptomeria). Their restricted range is also an indication of former greatness. Thus Glyptostrobus is Chinese, Sciadopitys is Japanese, Tawania is confined to Formosa, Cunninghamia and Cryptomeria are Chino-Japanese, Athrotaxis is Australian, Sequoia is confined to the Pacific and Taxodium to the Atlantic border of North America. The family is unrepresented in Europe, South America or Africa at the present time. Its fossil history constitutes one of the romances of paleobotany illustrating the antiquity, growth to cosmopolitanism and subsequent wane of the various types. The oldest known genus that appears to represent this family is the Permian and Triassic Voltzia, with dimorphic distichous foliage, long, slender, cylindrical cones of imbricated three to five lobed sporophylls, and two or three winged seeds. There are at least half a dozen species known and they are recorded from Europe, Asia and South America, but not certainly from North America.

Another ancient and truly cosmopolitan genus was Cheirolepis with distichous twigs, short pointed leaves and five lobed two-seeded sporophylls. A genus of doubtful affinities is leptostrobus of the Jurassic of Asia and North America, although Sequoia appears toward the end of that period (Portlandian). In the Lower Cretaceous the more noteworthy genera are Sphenolepis and Athroaxopis, although Sequoia is undoubtedly represented by foliage, cones and structure material at widely separated localities.

The Upper Cretaceous genera are Geinitzia, which may belong to the Araucariales; Ceratostrobus and Microlepidium, European genera; Cunninghamiostrobus, a Japanese genus based upon structural cone material; Cunninghamites, which had numerous species in Greenland, Europe and North America; and Sequoia which is abundant and recorded from all the continents except Africa and Australia, and from Spitzbergen on the north to Graham Land on the south. During the Cenozoic, especially during the older Tertiary, Sequoia continued unabated and is recorded from all the continents except Africa. Athrotaxis is recorded from Europe, Cryptomeria is found in Europe and the Arctic, while Taxodium and Glyptostrobus are found everywhere throughout the northern hemisphere in the greatest abundance, and both genera are still present in Europe as late as the early Pleistocene.

The most obvious characteristic of the family Cupressaceæ is the cyclic arrangement of the reduced leaves, a feature which, acquired early in their history, has continued unchanged from the Cretaceous to the present. The cones are small and are hard or fleshy at maturity. The existing genera are nine in number and contain about 80 species, of which 40 per cent belong to the genus Juniperus. The smaller genera show apparent anomalies of distribution coupled with an extended history.

There are a number of Mesozoic genera of which Brachyphyllum (Echinostrobus) is the most prominent and including Raritania, Thuites, Androvettia and presumably Moriconia and Inolepis, which have been investigated anatomically and which show various combinations of the following features: sclerotic pith, lateral pits of ray cells, branched leaftraces, mucilaginous resin canals, uniserial spaced bordered pits of the tracheids passing into alternating and sometimes mutually flattened series, transfusion tissue not lateral to the foliage strands but showing a tendency to surround the phloem. These and other features are regarded in some quarters as indicating that these genera are descended from the Abietineaceæ and should be included in the order Araucariales — a view that has received but slight acceptance and one that is dissented from in the present article.

The family history goes back to Widdringtonites of the Triassic, and to Palæocyparis and Brachyphyllum of the Jurassic. These are not altogether conclusive in their testimony, but the family springs into unquestionable prominence during the Upper Cretaceous at which time in addition to Brachyphyllum, Thuja, Thuites, Juniperus and disputed genera like Androvettia, Moriconia and Inolepis, there were well-marked species of Widdringtonites, and Frenelopsis in which the foliar features are substantiated by fructification characters, which in the case of the valvular cones of the Actinostrobinæ are unmistakable. The genera Callitris, Cupressus, Chamæcyparis and Libocedrus appeared in the Eocene, while many of the Cretaceous genera survived into that time and attained an extended range.

The family Abietineaceæ is characterized by almost completely distinct bract and scale, by winged pollen, short shoots, needle leaves and various recondite anatomical features of unproven phylogenetic import. They are admittedly the most complex morphologically, and are usually regarded as the most modern family of Coniferophytes, although some students consider them to represent the ancestral stock from which the Araucarialea, Taxales and the Taxodiaceæ and Cupressaceæ have been derived by reduction. Whichever view finally prevails there can be no question but that in the light of present knowledge they have much the shortest geological history. There are nine genera and about 125 existing species, of which more than half belong to the genus Pinus, and they form extensive forested areas in the North Temperate Zone, to which they are practically confined. Extinct genera are rare and include the Upper Cretaceous Prepinus, Entomolepis and Plutonia. Among the still existing genera Pinus has numerous extinct species and goes back to the Lower Cretaceous (Pinites or Abietites). Cedrus goes back to the Lower Cretaceous, Picea and Abies to the dawn of the Upper Cretaceous, while Tsuga, Pseudotsuga and Larix are exclusively Tertiary and Recent. The family is especially varied and widespread in the relatively short period from the Oligocene to the Recent.

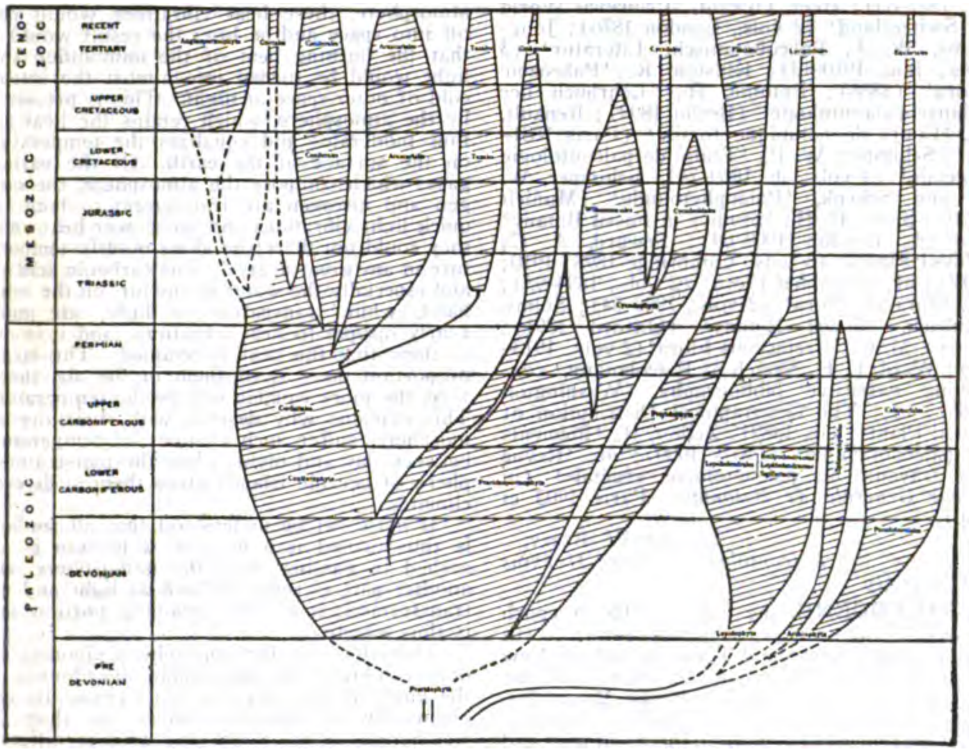
Angiospermophyta.— In contrasting the angiosperms with the coniferophytes or with any of the other great groups of seed plants one is impressed with the lack of knowledge of both recent and fossil forms. Making their appearance in the geological record during the Lower Cretaceous they soon outdistanced all competitors and from the Eocene to the present they have been the dominant plant group. Over 100,000 existing species are known and the fossil forms, even in the relative short period of their dominance, probably outnumber the recent, so that vast numbers of species and very imperfect knowledge render a generalized presentation impossible. The angiosperms undoubtedly show the most perfect adjustment of the plant organism to a strictly terrestrial existence. Adaptable to a degree unequaled in other phylæ they inhabit the most diversified environments and some have secondarily invaded the sea margins as well as the lakes and streams, while others have become parasites, saprophytes or epiphytes. The modification of their flowers for securing cross pollination through the agencies of insects or birds is well known as are the various modifications of fruits and seeds for dispersal by wind, mechanical ejection, floating, passing unharmed through the alimentary tract of birds or mammals, sticking or clinging to fur or feathers, etc. (see articles CROSS FERTILIZATION; DISPERSAL). Ranging in size from tiny aquatics to giant trees several hundred feet tall and ranging in their life span from that of a single season to several thousand years they are the most impressive members of the vegetable kingdom. Fruits are confined almost exclusively to angiosperms and are apparently one of the effects of fertilization as specializations for protection and dispersal of the seeds. The variety of fruits is almost as great as that of flowers and must be considered an important factor in the success of the angiosperms as well as one of their prime benefits to humanity. It seems more than a coincidence that the evolution of a group of plants of the capacity of the angiosperms in which, as in some of the cereals, 30 per cent of the total weight of the plant is stored as elaborated food in the seeds, should have been contemporaneous with the evolution of the warm-blooded animals. At any rate it seems certain that human civilization could not have evolved but for the evolution of this plant phylum. The angiosperms are so numerous and present so many morphological diversities that it is impossible to give a succinct characterization (see articles BOTANY; SEED PLANTS). Their outstanding feature is angiospermy itself, i.e., pollination results in bringing the pollen spores in contact with a receptive surface of the carpel (stigma) and not with the ovule, as in all other known seed plants. All known angiosperms have closed ovaries and no other phylæ have. At the same time it should be recalled that angiospermy was itself a product of evolution and that some time a series of fossil forms may be discovered showing this character in the formative stage. Anatomically angiosperms are characterized, the dicotyledons normally and the monocotyledons primitively by the vascular system of the stem constituting a tubular cylinder (siphonostele) of collateral bundles and having leaf gaps. The wood is marked by the presence of vessels arising through cell fusion — a feature common to the gnetalean coniferophytes and one absent in certain specialized families of angiosperms such as the Cactaceæ and Crassulaceæ and in other possibly primitive families such as the Trochodendraceæ. The improved conductive and supporting tissues of the angiosperms result in a general improvement in storage tissues and in a great expanse of foliage and consequently a greatly increased production of nutritive materials. These histological features as well as the floral morphology to be alluded to presently are features of the sporophyte generation. The history of the male gametophyte does not differ materially from that which obtains in the various gymnosperm phylæ but the female gametophyte is not only more reduced but its development is associated with new and peculiar features. Free nuclear division in the egg is wanting (a feature common to Gnetum and Tumboa among the Gnetales). The process of what is commonly called double fertilization is a strictly angiospermous characteristic. Among the units organized in the embryo sac is what is known as an endosperm nucleus. One sperm unites with the egg nucleus and the result of this union is the embryo, the second sperm nucleus unites with the endosperm nucleus and the result of this union is the trophophyte or endosperm which furnishes the nutriment for the developing embryo and the subsequent germinating plantlet. This course of events is strikingly uniform throughout the phylum and is unknown in other plants. Those who consider the formation of seeds as the most important characteristic of a definite group of vascular plants (Spermophyta) ignore the history of the origin of the seed habit and the result is no more natural than the Exogenous and Endogenous classes or than one which attempted to use homospory and hespory to define natural groups of the remaining vascular plants. Moreover such a treatment is confronted with the necessity of defining a flower. If a flower is considered as a group of sporophylls in order to include the gymnosperms it then includes many of the so-called flowerless plants. If, on the other hand, the gymnosperms are placed in their correct perspective and a flower is defined as a group of sporophylls associated with a perianth the limit of the flower corresponds almost exactly with the limits of the phylum (except Gnetales) and the necessity, if such exists, for abandoning the convenient term flowering plants, as some students have advocated, is obviated. The popular concept of a flower is too firmly intrenched to warrant any attempt to arrive at a more philosophical morphology and the fact that the floral envelopes are lacking either primitively or by reduction in some groups is no more pertinent than the fact that some flowers consist entirely of floral envelopes and lack sporophylls. The presence of floral leaves (calyx and corolla) surrounding the sporophylls and derived both from sterilized sporophylls and bracts appears to have been conditioned largely by the habit of entomophily. Although the primitive floral envelopes were probably protective in their function certainly their subsequent history and great diversity of detail are the result of entomophily. In the more primitive flowers the sporophylls tend to be free and the axis tends to be elongated with the members in a spiral arrangement. Evolution of the flower proceeded along the lines of reduction in axial length until the members passed to a cyclic arrangement when they tended to become definite and fewer in number and at length became confluent to a greater or less degree. The three marked stages are termed hypogynous, perigynous and epigynous and all grades of intermediate stages are present. Inequalities of growth result in other diversities. The members tend to evolve from a radial symmetry (actinomorphic) to a bilateral symmetry (zygomorphic) or to an isobilateral symmetry with two planes of symmetry and with the halves unlike.

Systematists segregate angiosperms into two series — monocotyledons and dicotyledons, and there has been almost endless discussion as to which line was the more primitive. Both were present in the Cretaceous so that history fails to shed any light on the problem. Formerly gymnospermous and other remains from the older rocks were thought to represent monocotyledons but none such are now recognized. Modern opinion tends in the direction regarding the distinctions between these two groups as largely cumulative and that the number of the cotyledons and the correlative characters are of less phylogenetic importance than was formerly believed. The view is here advocated that the angiosperms are strictly monophylatic, that the monocotyledons are not primitive, nor did the primitive angiosperms exhibit combined monocotyledonous and dicotyledonous characters, but that the dicotyledonous type is the more primitive, and that it has given rise to the monocotyledonous stock, not, however, as a single or monophyletic line of evolution but by one such line combined with several reduction series derived from different regions in the dicotyledonous plexus. Systematists have long recognized the similarities between the monocotyledonous arums, pondweeds and screw pines on the one hand and the dicotyledonous peppers and willows on the other, as well as the convergence of certain Ranalian groups and the water plantains. The case of the water-lilly family is a classic instance of a group of dicotyledonous origin which has essentially reached the monocotyledonous category. Analogies between the amphisporangiate "flowers" of the aberrent Cycadeoideas of the Mesozoic and such dicotyledonous flowers as those of the Magnolia have furnished a basis for a theory of angiosperm descent which while fascinating is believed to be illusory. More definite evidence for a revival of the old view that the angiosperms are related to the gymnosperms through the amentiferous dicotyledons and some gnetalean type similar to Gnetum has recently been accumulated. This evidence comprises the character of the inflorescence, the floral morphology, the details of sporogenesis, fertilization and embryogeny, the organization of vessels in the wood, the broad rays, companion cells in the bast, the habit and foliage, the dicotyledonous embryo, the elimination of archegonia and the organization of eggs. The foregoing considerations are derived entirely from a study of recent forms since no certainly determined fossil forms of Gnetales are known, and no known fossil angiosperms throw any light upon their phylogeny.

The taxonomy of the angiosperms is still in a most unsatisfactory state. The chief steps in their classification have been taken by Ray (1703), Jussieu (1789), De Candolle (1819), Endlicher (1836–40), Brongniart (1843), Braun (1864), Bentham and Hooker (1862–83), Eichler (1883) and Engler (1892). While very imperfect and founded to a too great degree upon floral morphology the classification proposed by Engler and derived largely from Eichler is the most satisfactory, and it has the additional advantage of having been elaborated as a comprehensive systematic treatise (see article BOTANY, CLASSIFICATION). The Monocotyledons and Dicotyledons may now be briefly characterized. In the former many of the forms are herbaceous which argues for modernity. Anatomically the bundles are closed (amphivasal), are without cambium, and are scattered through the parenchymatous ground mass of the central cylinder. Sometimes the bundles indicate a primitively circular arrangement such as obtains in the dicotyledons and the theory that a tubular central cylinder with foliar gaps was an ancestral condition accords with the view of phylogeny here advocated.

This does not mean, however, that the monocotyledons are strictly modern and monophyletic. The flowers tend to be trimerous and chalazogamy has not been observed. There is a greater reduction of sporogenous tissue in the megasporangium. There is one seed leaf or cotyledon which is terminal in position while the stem tip is lateral. The leaves are poorly differentiated into blade and stalk and tend to be entire, sheathing and lack stipules. The venation is closed and the primary and lesser systems are so sharply contrasted that the leaves are commonly considered parallel veined, and even when the latter feature is less obvious as in the arums and many tropical forms the contrast in calibre just mentioned remains obvious. In the dicotyledons the stem shows a tubular cylinder (siphonostele) of collateral bundles, a persistent cambium form secondary phloem and xylem, both of which elements arise through cell fusion. Secondary thickening results in a relatively larger display of assimilative tissue (foliage) and a branching habit. The cotyledons are two in number and lateral in position and during germination the growing points and cotyledons are liberated by the elongation of the hypocotyl as contrasted with the monocotyledonous tendency to free the root and stem tip by the elongation of the cotyledon which functions as an absorbing organ suggestive of the "foot" of pteridophytes. The dicotyledonous flowers tend to be four or five merous. The leaves are well differentiated into petiole, blade and frequently stipules are present. The venation is graduated and open and hence prevailingly netted veined and this results in all degrees of lobation and division of the laminæ.

Historically the oldest known angiosperms are found in the Lower Cretaceous of Greenland, North America, Europe and New Zealand. These earliest known types do not appear to be primitive (only the foliage and secondary wood structures are known), and an extended early but unknown period of evolution seems to be demanded. By the close of the Lower Cretaceous both monocotyledonous and dicotyledonous angiosperms are not uncommon. These include palms and most of the principal families except the most specialized such as the orchids among the former and the composites among the latter. A second modernization of the flowering plants took place at the dawn of the Tertiary and a third modernization in the Miocene. The Miocene floras were much like those of the present, but were richer in arborescent types and the forms were more widely distributed than they are at the present time. The bulk of the herbaceous vegetation appears to have been relatively modern in its evolution and those large groups or parts of groups that are especially characteristic of existing temperate floras, such as the Cruciferæ, Borraginaceæ, Labiatæ, Compositæ, Umbelliferæ, Krameriaceæ, Papilionaceæ, etc., were relatively very modern and their main evolutionary deployment seems to have been largely Pleistocene and postglacial. The subject is much too large for treatment in the present article but a somewhat full discussion of the geological history of the



[*Courtesy of Johns Hopkins University*]

Fig. 5.— Geological History and Phylogeny of Vascular Plants.

angiosperms will be found in the 'Proceedings' of the American Philosophical Society (Vol. LIII, pp. 129–250, 1914).

Conclusion.— The mutual relationships of the various groups of vascular plants that have been briefly discussed in the preceding paragraphs are shown in Fig. 5, which aims to represent graphically their phylogeny as understood by the writer and their relative importance throughout geologic time.

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PALEOCENE, the lowest (oldest) epoch of the Cenozoic Age, embracing in North America the Puerco and Torrejon beds of New Mexico, and the Fort Union formation of the region east of the northern Rocky Mountains. None of these are marine formations, and it is believed that at this period the continent had substantially its present outlines and mountain ranges; but the Appalachians were worn almost to levelness, and the plateau and mountain region on the Pacific slope were much less elevated than now. It is probable that Asia and Alaska were connected by land. The climate was semi-tropical in character, and the interior of the country contained large lakes and water-courses. «Vast stretches of subtropical and more hardy trees were interspersed with swamps where the vegetation was rank,» says Osborn, «and accumulated rapidly enough to form great beds of lignite. Here were bogs in which bog-iron was formed.» The animal fossils show a general resemblance to Mesozoic types, and consist largely of reptiles, such as huge turtles, crocodiles, lizards, with many fresh-water shells. The conditions at the time in South America seem to have been much the same; but in Europe the fossils of the Paleocene show that many of the beds were of marine origin, and that the climate was cooler than in America. Consult Scott, 'Land Mammals in the Western Hemisphere' (New York 1913).

PALEOCLIMATOLOGY. Climatology treats of the changes in the atmosphere, geographically and in time. At the basis of these variations is temperature, and the source of the heat is nearly all solar. The earth is internally hot, but almost nothing of this heat attains the surface. It has been well said that the atmosphere is a kind of blanket put about the earth to keep it warm. The reason for this is that the air is transparent to those rapid vibrations of ether received from the sun which we know as light. On reaching the ground, however, a considerable portion of the light is transformed into much slower vibrations, which we perceive as heat. Now if there were no atmosphere, these heat vibrations would pass off into space and be lost; the result would be that the burning heat of the unmodified sunlight would be turned into almost the intense cold of outer space at night. This is prevented by the atmosphere, which retains the heat and thus moderates and equalizes the temperature on the surface of the earth. Of the various gases which compose the atmosphere, the oxygen and nitrogen are transparent to both the quick light vibrations and the slower heat ones; they could not therefore alone modify temperature in any great degree. The carbonic acid gas and especially the water in the air, on the other hand, while transparent to light, are more nearly opaque to heat vibrations, and it is due to them that the heat is retained. The larger proportion there is of them in the air, therefore, the more equable will be the temperature. This explains why deserts, with their dry atmosphere, suffer such changes of temperature between day and night, while the moist atmosphere of oceanic islands gives them such even climates.

It must not be understood that all sunlight is thus turned into heat, as a portion is absorbed in passing into the atmosphere and another part is reflected back as light and not transformed; it is the remaining portion that is thus effective.

The effects of the atmospheric changes not only condition the geographic distribution of the kinds of life, but also react physically and chemically on the lithosphere, so that the weathering of the rocks and soils is different in the cold and warm and in the wet and dry areas. It is well known that the mechanical alteration of rocks is greatest in cold climates, high altitudes, and deserts, while the chemical changes are most marked under warm, moist conditions. In fact, an abundance of moisture in warm climates stimulates a rich vegetal and bacterial growth that liberates much carbonic acid, and this, along with the oxygen of the air, brings about the highly decomposed soils of tropical lands.

The surficial areas of the present isothermal climatic belts, according to A. Supan, are as follows:

	Warm zone	Temperate zones	Cold zones
Northern hemisphere....	53.3	31.8	14.8
Southern hemisphere.....	45.4	45.1	9.5
Average................	49.3	38.5	12.2
	or as 8 is to 3 and 1		

Paleoclimatology, on the other hand, is the study of the succession of climates, as observed in their reactions on the inorganic and organic materials throughout the geologic ages. The methods of study in the two sciences are therefore very different. In climatology, observation is direct, for we are living under the influence of the actual climates and so can study their character and effects upon the things alive and dead, while in paleoclimatology the atmosphere is not present, and the methods of study are indirect and determined from its operations upon the plants and animals of the past and upon the earth's sedimentary rocks.

During the first half of the 19th century, it was assumed by most astronomers and geologists that the earth began as a star, a small, hot, self-luminous body. In the course of time, the earth was said to have slowly cooled, and finally to have become non-luminous and encrusted, attaining only very recently its cooled climate and polar ice caps. We therefore see that the older geologists believed that the climates of the past were warm and equable the world over; the idea that the earth had recently passed through a glacial climate came into general acceptance only during the latter half of the previous century. More recently geologists have learned that the earth has had many cooled climates, most of which were localized, while at least three were glacial ones, affecting the whole earth. We now know, moreover, that the climates of the geologic ages have varied much, and through the added results attained by biologists and paleontologists regarding the biological regions of the warmth-loving plants and animals, it is seen that a new science — paleoclimatology — is in development.

The plants and animals are also self-registering thermometers, and the marine "life thermometer" indicates vast stretches of time of mild to warm and equable temperatures, with but slight zonal differences between the equator and the poles. The great bulk of known marine fossils are those of the shallow seas, and the evolutionary changes recorded in these 'medals of creation' are slight throughout vast lengths of time that are punctuated by short but decisive periods of cooled waters and great mortality, followed by quick evolution, and the rise of new stocks. The times of less warmth are the *miotherm* and those of greater heat the *pliotherm* periods of Ramsay.

On the land the story of the climatic changes is different, but in general the equability of the temperature simulates that of the oceanic areas. In other words, the lands also had long-enduring times of mild to warm climates. Into the problem of land climates, however, enter other factors that are absent in the oceanic regions, and these have great influence upon the climates of the continents. Most important of these is the periodic warm-water inundation of the continents by the oceans, causing insular climates that are milder and moister. With the vanishing of the floods somewhat cooler and certainly drier climates are produced. The effects of these periodic floods must not be underestimated, for the North American continent was variably submerged at least 17 times, and over an area of from 154,000 to 4,000,000 square miles.

When to these factors is added the effect upon the climate caused by the periodic rising of mountain chains, it is at once apparent that the lands must have had constantly varying climates. In general the temperature fluctuations seem to have been slight, but geographically the climates varied between mild to warm pluvial, and mild to cool arid. The arid factor has been of the greatest import to the organic world of the lands.

It is seemingly clear that the variability in the storage of solar radiation by the earth's atmospheric blanket and by oceanic waters and the consequent climatic variations of the past and present are due in the main to topographic changes in the earth's crust. These surficial changes alter the configuration of the continents and oceans, the air currents (moist or dry), and the oceanic currents (warm, mild or cool).

On the other hand, a great deal has been written about the supply and consumption of the carbonic acid of the ancient climates as the primary cause for the variable storage of warmth by the atmospheric blanket. A greater supply of carbon dioxide is said to cause increase of temperature, and a marked subtraction of it to bring on a glacial climate. This aspect of the climatic problem is altogether too large and important to be entered upon here. It is permissible to state, however, that the glacial climates are irregular in their geologic appearance, are variable latitudinally, as is seen in the geographic distribution of the tillites between the poles and the equatorial region, and finally that they appear in geologic time as if suddenly introduced. These differences do not seem to be conditioned in the main by a greater or smaller amount of carbon dioxide in the atmosphere, for if this gas is so strong a controlling factor, it would seem that at least the glacial climates should not be of such quick development. On the other hand, an enormous amount of carbon dioxide was consumed in the vast limestones and coals of the Cretaceous, with no glacial climate as a result; though it must be admitted that the great limestone and vaster coal accumulations of the Pennsylvanian were followed by the Permian glaciation. Again it may be stated that the Pleistocene cold period was preceded in the Miocene and Pliocene by far smaller areas of known accumulations of limestone and coal than during either the Pennsylvanian or Cretaceous, and yet a severe glacial climate followed.

Briefly, then, we may conclude that the markedly varying climates of the past seem to be due primarily to periodic changes in the topographic and geographic forms of the continents and oceanic areas, plus variations in the amount of heat stored and distributed by the oceans.

The factors in paleoclimatology are four in number, and stated in the order of their historic development are as follows:

.(1) *Tillites.*— Glaciers of to-day deposit in front of themselves either sheets of glacial bowlder clays or moraines that are composed of heterogeneous materials such as unconsolidated sand and muds and rocks that are subangular and rounded along with others that are facetted and striated. These are the glacial tills of the Scotch geologists, while the ancient ones of like origin, but now consolidated into hard rock formations, are known as tillites.

Our knowledge of glacial climates had its origin in the Alps and chiefly through the studies of De Charpentier between 1815 and 1834, and of Louis Agassiz beginning in 1836. From their teaching we now know that alpine glaciers and vast continental sheets of ice, thousands of feet thick, covered widely many parts of the world, not only polar lands but temperate parts as well, during the Glacial period. Through a study of the present glaciers and the work they do in spreading the tills far and wide over the lands as they melt and retreat, geologists have learned to discern in the tillites their significance as to the former glacial and locally cooled climates. Curiously, in early Permian time glaciers were widely spread to the north and south of the equator and not at all in northern temperate and arctic areas, resulting, however, in cool and semi-arid climates in North America and northern Europe. In fact, tillites are known as far back in geologic time as the early Proterozoic, and others are present in formations deposited in Ordovician, Silurian, Devonian and Eocene times.

(2) *Paleontology.*— On the basis of the present distribution of life (zoogeography), paleontologists have long been aware, through their studies of the fossils, that variations in the climates of the past may be discerned more especially in the higher plants, insects, corals, shelled cephalopods and foraminifers. When explorers in Arctic America brought the information that whole beds of limestone in that region are made of Silurian corals, and that in the Tertiary of Greenland occur leaves of the bread-fruit tree and other warmth-loving plants, it became apparent that these places must at times have had warm climates like those of Italy and Florida at present. In the course of a century of biologic and paleontologic endeavor paleontologists have learned much regarding the zonal distribution of ancient life. Therefore when they encounter an abundance of fossil corals and especially coral reefs and limestones made up of large forms of foraminifers in far northern lands such as Alaska and Spitzbergen, they regard this as conclusive evidence that the waters in which they lived were warm. Marine reefs of the present and past, built by calcareous algæ, sponges, calcareous hydroids, corals and tubiculous worms, and banks of thick-shelled bivalves, are all known to be indicative of warm and shallow waters. Gastropods with thick calcareous opercula are evidence of the same nature. Marine shell faunas in great variety of forms are of warm waters, while in cool to cold ones there is usually a great duplication of but a few species. Assemblages of large insects point to warm climates, while small ones show reduced temperature. Large-shelled cephalopods, like those of the Ordovician, Silurian, and more especially of the Jurassic and Cretaceous, bespeak warm waters.

On the lands, ringed woods are nearly always indicative of climates with winters, while palms, tree ferns, cycads, magnolias, figs, planes, tulip and bread-fruit trees are of warm climates. Trees and shrubs occur in far less variety under cool climates than is the case in warm ones. Turtles, snakes, lizards and dinosaurs do not live in cold climates, while mammals are in greatest variety in temperate areas and in the semi-arid regions of the tropics.

(3) *Topography and Paleogeography.*— Geologists have long been pointing out that the earth's history is cyclic or periodic in nature. For very long times the lands are low and more or less widely flooded by the oceans. Then the climate throughout most of the world is oceanic, that is, it is warm, moist and nearly uniform. The lands are base-leveled and the geologic formations are essentially of the seas and oceans. Thin deposits and widespread limestones and calcareous shales are characteristic of these times, along with the formation of coal beds. Subsequently the earth for a time loses its isostatic balance and readjusts itself through internal rearrangements. The lands in relation to the strand lines are then higher and much larger, while their borders are apt to be elevated into mountain chains, and the climates are cooled or may become even glacial. Zonal and arid climates, from tropical to cold, are prevalent. The oceanic overflows are then also least in area, and the geologic formations, because of accelerated erosion, tend to be coarse and of greater thicknesses, together with the presence of fresh-water deposits that are usually barren of fossils and often red in color. It is essentially at these times that gypsums and salts and glacial deposits are laid down. The organic world then also loses its ecologic balance, is stimulated to change, and forced to readapt itself through evolution to the altering environment.

The climates of entire areas may be greatly altered by the formation of some new land or mountain range, or through the birth of a land-bridge uniting two continents, for these may divert or even bar air and oceanic currents. Think, for instance, of what would happen to northwestern Europe if the Panama bridge were deeply beneath the sea so that the equatorial currents flowing into the Caribbean would pass into the Pacific. There would be no Gulf Current to warm western Europe, and it would be as cold and inhospitable as Labrador. When mountain ranges are high, they divert the air currents and extract from them their moisture, causing one mountain side to be moist while the other may be more or less arid. And it may make a great deal of difference to the local climate as to how the mountains trend. Finally, when most of the continents are large, high and mountainous, as at present, then the earth has cooled to glacial climates.

(4) *Petrology.*— Johannes Walther was one of the first to direct attention to the sedimentary formations of the ancient seas, and more especially to those formed by fresh water and by the air, as having within themselves a climatic record. He pointed out that the deserts of central Asia are red in color, that carmine-red dunes are wandering across Arabia, while yellows are of wide distribution in Trans-Caspia and in Africa. In temperate regions, the soils are chiefly gray, yellow or brown in color, while in tropical ones they are red and the laterites are brown-red. In America Joseph Barrell has written much on the same subject. It is now evident that the color and chemical content of the geologic formations are largely connected with climate. Alternations in color from red deposits to gray and white sandstones

and conglomerates, with coal beds such as occur in the American Carboniferous succession, appear to indicate wide swings of climatic change from warmth and semi-aridity to cooled, humid and probably even cold climates. Accumulations of salts and bedded gypsums are indicators of dry climates, while widespread formations of limestones are looked upon as evidence of warm-water seas. On the other hand, coal beds are usually regarded as formed in swamps under temperate to cool climates. Loess is accumulated dust blown out of the deserts into moist grass-covered areas. Finally, all mudstones that are «sun-cracked» are evidence of seasonal exposing and the drying out of the contained water by the atmosphere. This phenomenon is particularly common in the oxidized red formations that were laid down under more or less arid climates. Through an understanding of the present operations of the laws of nature, we thus learn how to discern their effects throughout the geologic ages, and to see that the rocks, like the living organisms, have within themselves the records of their originations and something of their ancestral histories.

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PALEOGEOGRAPHY. Geography is the science which describes the earth's surface, including the distribution of the living things upon it at the present time, and more especially of mankind, the dominating influence among the organisms. Paleogeography, on the other hand, treats of the succession of geographies of the past, i.e., the prehistoric geographies, as known to geology and paleontology. In other words, paleogeography is the synthesis of the earth sciences based on the record of the rocks of the earth's surface. The term paleogeography was first used by T. Sterry Hunt in 1872 for «the geographical history of ancient geological periods,» but it is only since 1896 that it has come into wide usage.

When, in the beginning of the 19th century, geologists began to perceive the vast significance of the doctrine of the Scotch geologist Hutton, who taught that «the ruins of an earlier world lie beneath the secondary strata,» and, further, that great masses of water-deposited rocks have been upheaved and thrust into mountain ranges, only to be later worn away by atmospheric agencies, it was but natural for them to look for the lands that had furnished the materials of these upheaved rocks. In this way the science of paleogeography had its origin, but because of the scantiness of geologic knowledge a century ago, the embryo science was almost wholly of a descriptive and not of a cartographic nature.

The French were the first to discern paleogeography, and it was Élie de Beaumont, between 1829 and 1852, who led the way by pointing out that the water-laid rocks had been elevated from time to time and pushed up to form the mountain chains of the earth's surface. We now know that where the seas have endured for many millenniums, and in the geosynclines of the continents where vast thicknesses of strata have accumulated, here later on a mountain range will rise and a new land be formed. The cause of these periodic risings of the mountains is the continual shrinking of the earth's mass, resulting in the shortening of its circumference, and in the buckling up of its surface into mountain ranges. When an over-ripe apple dries out and becomes smaller in mass, its skin wrinkles, and in the same way the earth shrinks into a smaller mass and its surface from time to time wrinkles into mountain ranges. These great changes in the earth's surface also bring about alterations in the atmosphere, and at times even produce severe glacial climates that affect the whole earth outside of the tropical regions. Furthermore, because of these changes, there come about marked alterations in the evolution and distribution of life.

The evolution of the earth's surface is cyclic in nature. During the longer part of each cycle, the lands are being leveled and reduced to a peneplain, and at these times the oceans flood the continents most widely. The long accumulations of shrinkage constantly going on within the earth attain the breaking stage, and the resulting movements produce on its surface high lands and mountain ranges. Then the seas begin to retreat more and more and are drawn into the oceanic basins, the continents at the same time attaining their largest size and greatest altitudes. In this way erosion again becomes active and another cycle of deposition and continental flooding is started. The sands and muds and the solution materials of the rivers are but the fragmented and dissolved mountains and high lands in transit to the oceans. For every grain of land transported into the marine waters, there is just so much water displaced. The result is that during the long quiet second part of the cycles, when the earth's crust moves but little, the oceans are constantly rising and flowing ever more widely over the continents. The oceanic level at rare intervals is also lowered by hundreds of feet over wide areas in the tropical region by the subtraction of the water and the piling of it upon the land as ice in the polar and temperate regions. The closing events of the cycles, or, better, periods of time, are known as the «disturbances,» but during some of them mountain making was by no means localized, for mountains may have been elevated almost simultaneously in several continents or even throughout most of the world. The times of widespread mountain making are known as «revolutions» in the history of the earth. In general it may be said that as the earth periodically shrinks, the lands become widely elevated in relation to the strand-line, while the oceans subside in compensation to the reduced mass.

More than 17 such cycles are recorded in geologic history in North America, and in this way the continent has been flooded over areas varying between 154,000 and 4,000,000 square miles by great inland shallow seas. These facts show how greatly the geography of the geologic past has been undergoing change. To-day we are living in the last phase of the first part of a new cycle, and the oceans have already begun their spread over the continents, as is demonstrated by the inland or marginal seas such as Hudson Bay, North Sea, Baltic Sea, and the continental shelves that border all continents.

Élie de Beaumont, at least as early as March 1831, in his geologic lectures in the College of France and at the Paris School of Mines, used to outline to his students the relation of the lands and the seas in the centre of Europe at the different great geologic periods. His first printed paleogeographic map appeared in 1833, and in the following year the Sicilian geologist Gemmellaro published six maps of Italy and De La Beche one of England. In America the first to show paleogeographic maps was Arnold Guyot in his Lowell lectures of 1848, but it appears that James D. Dana was the first to publish such maps, three of which were included in his epochal work of 1863, the Manual of Geology. Of world paleogeographic maps, Jules Marcou published the first one in France in 1866, but the most celebrated of these early greater attempts was the well-known map published by the Viennese paleontologist Neumayr in 1883.

Since 1833 there have appeared not less than 500 different paleogeographic maps, and of this number about 210 relate to North America. Nevertheless, paleogeography is still in its infancy, and most of the maps embrace too much geologic time, all of them showing the changes that transpired during tens of thousands, and some of them during millions of years. Mariners' maps show the conditions of the strandlines at the times of their making, and those made even 50 years ago have to be revised again and again if they are to be safely followed by the coastal navigator and by the engineer. Therefore paleogeographic maps should ever tend toward depicting smaller amounts of geologic time, if they are to show the actual relation of water to land and to illustrate the movements of the periodic floodings. Moreover, the ancient shore lines of the paleogeographic maps are all more or less hypothetic and are drawn in sweeping curves, unlike modern strands with their islands, bays and headlands. Also the ancient lands are usually drawn as almost featureless, and only rarely do the maps indicate the probable drainage. In the course of time, paleogeographic maps will show the features of the lands, such as the mountain ranges and volcanoes, the climatic zones, and something as well of the distribution of the life of the time depicted, while the seas will be shown with their probable depth, temperature and currents.

As yet, no one has attempted to picture the geographies back of the Cambrian — a vast time almost devoid of recognizable fossils. This means that all of our attempts are limited to the last half of geologic time, which has an abundance of fossils in formations that usually have not been greatly altered by the dynamic forces of the earth's moving crust or lithosphere.

Paleogeography is the synthesis essentially of the sciences of geology and paleontology. The discerning of the ancient geographies is based mainly on eight factors. These, stated in the order in which the data are used, are as follows:

(1) *The Formations.*— The units in geology are the geologic formations, masses of rock either stratified or unstratified, of one kind or of various kinds, formed in the seas and oceans or on the lands, with or without fossils, and composed either of sediments, conglomerates or igneous materials. Their present geographic distribution is the first basis for deciphering the geographies of the past.

(2) *Superposition.*— The geologic age of a formation is determined first through superposition. It naturally follows, if in a given area there are several superposed formations which have not been disturbed through crustal folding, that the lowest one must be older than those above. Also that when they are cut by igneous rocks these crystalline masses must be younger than the formations through which they rose when molten.

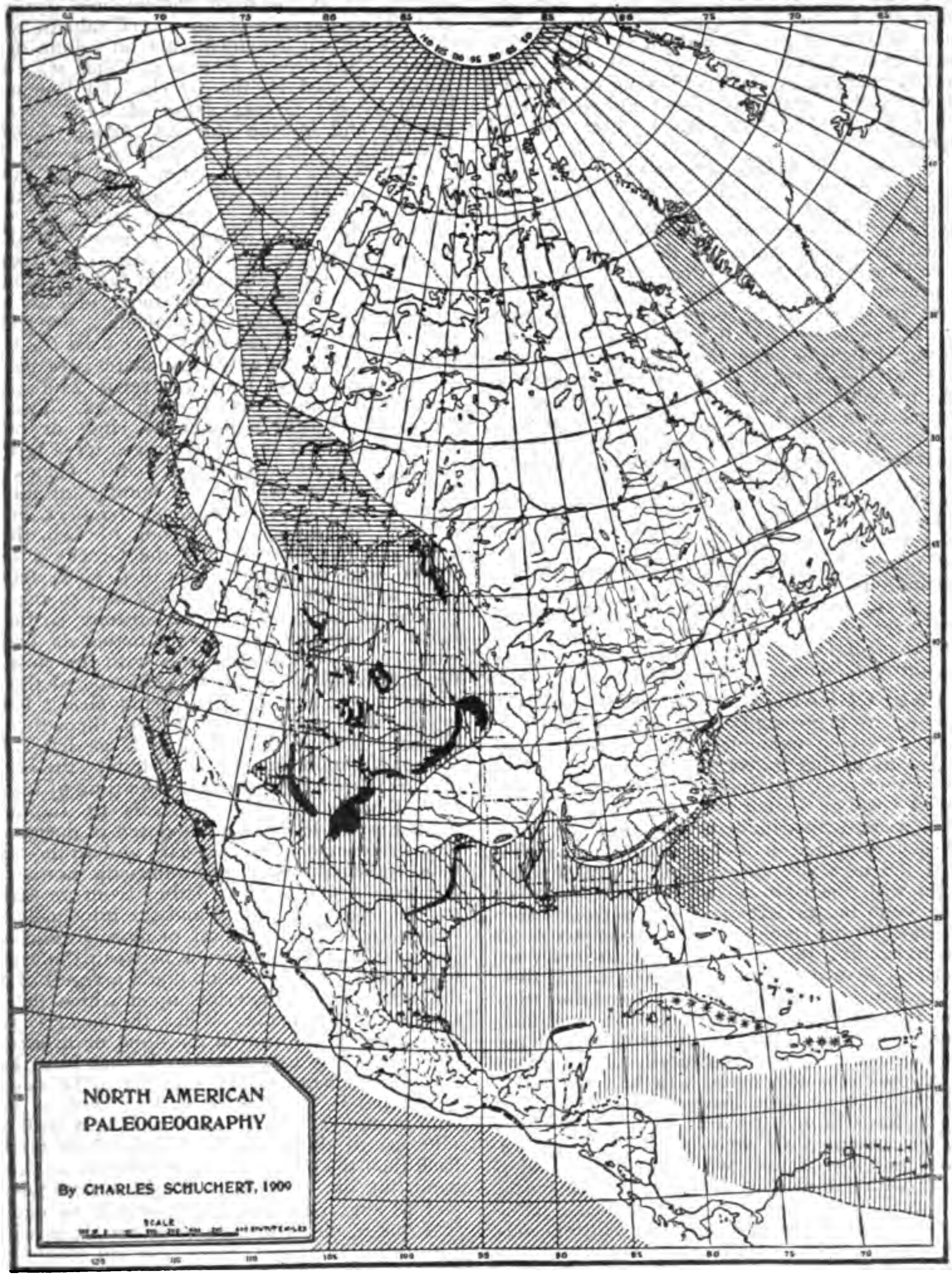
(3) *Paleontology.*— In general practice, when a formation has fossils, these, along with superposition, determine its limits and its geologic age. Fossils are the basis of most geologic chronology, because all life is in the constant state of change comprehended under the term organic evolution. The individuals change into different species or even genera, and the species of an assemblage die out or migrate elsewhere or are added to by the introduction of new ones of local origin or by immigrants. In other words, the organic assemblages constitute a series of automatically placed time cards. Therefore any fauna or flora indicates more or less accurately the geologic time of its existence. Fossils, furthermore, tell much about the environment in which they lived, whether in the seas or oceans, on the lowlands or highlands, in the swamps, rivers or lakes, and whether the climates were cold, temperate or tropical. In all of this the paleontologist is guided by the distribution of life as it is at present, and by the Hutton-Lyell principle that at all times the laws of nature have operated uniformly and as we see them to-day.

(4) *Petrology.*— The petrologic factor shows the significance of the macro- and microstructure of the rocks. Through the operation of the phenomena of the present, the geologist is guided in his interpretation of the rocks, as to whether they were formed in the water or by the winds, in the seas and oceans or in the rivers and lakes, or on the dry lands under pluvial or arid climates. Also as to the probable depth of water in the seas, the amount of its agitation, and whether the rocks were formed near to or far from the shores. The environment automatically impresses itself upon the accumulating sediments, just as it brings about the evolution of all living things.

This method also distinguishes the igneous or once molten rocks from those of sedimentary origin, and helps to point out not only the proximity of volcanoes, but, what is far more important in paleogeography, the former position of mountain ranges now all eroded away except their roots.

(5) *Diastrophism.*— The geologic record of the lands is locally a discontinuous one, but in the inaccessible ocean basins it is probably continuous. Consequently what any geologist sees is but a fraction of the record, and these fragments of knowledge he pieces together into one continuous geologic history, embraced in historical geology. Everywhere the geologic sequence is full of «breaks,» which are also known as «intervals» of time, when no record was being made other than that of erosion. These breaks or intervals have shown that the recording goes on now here and now elsewhere, and that it is periodic and cyclic in nature, as discussed earlier in this article.

(6) *The Time Factor.*— Geologic time is exceedingly long, measured by human standards.



The Paleogeography of Early Cretaceous Time (Benton Formation) in North America.

On the basis of radium disintegration, it appears that geological work has been going on for at least a billion years. This factor then emphasizes the importance of the breaks in paleogeography, and directs attention to them as representing land intervals that endured thousands or even millions of years.

(7) *Permanence of the Oceanic Basins.*— In the first half of the 19th century it was widely held that all parts of the oceans had been land, and that all of the lands had been beneath the sea. The latter half of this statement is now known to be true, for over most of the continents occur marine strata, though they are almost exclusively those of shallow seas. Not more than 1 per cent of them are deposits like those of the great oceanic depths, and because of this fact the belief is now general that the continents have never been covered by deep oceans. In other words, the continents

of to-day have always existed, but it does not naturally follow that they have always had their present shape. The truth is, rather, that from time to time their outlines have been greatly changed by the overflowing oceans, and at times they may have been united to each other by land-bridges (q.v.), like that of Panama to-day.

The oceanic basins appear to be the most constant features of the earth's surface, and while their shallow-water areas have changed much in the course of geologic time, yet the actual or deeper parts of the oceanic basins have long had about the shapes that they have at present. The Pacific has been the most constant in shape, as it seems that the Atlantic and Indian oceans greatly altered their outlines during Paleozoic and Mesozoic times. Because of the increase of water with time, it is also probable that all of the oceans have increased somewhat in area, and in depth as well.

(8) *Present Geography.*— The present geographic map is the base over which is drawn a given paleogeography. The time will come when but one geography will be shown, and that will be the paleogeography of the time illustrated by the map, but for some time yet the present geography is necessary for the orientation of the ancient one.

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PALEOGRAPHY, or PALÆOGRAPHY, pā-lē-og'rā-fi, the study of ancient handwriting from surviving examples: distinguished from Epigraphy in that Paleography takes cognizance of writing executed with such instruments as a reed (*calamus*) or a style (*stilus, graphium*) on papyrus, waxed tablets, parchment or other substances, which in different ages have fulfilled the uses of paper, while Epigraphy has to do with inscriptions cut in stone, metal or other enduring materials. Sometimes the term Paleography is employed in a wider sense, as comprehending the art of reading ancient writings and such a critical knowledge of all their circumstances as will serve to determine their age, if they happen to be undated, and their genuineness in the absence of any formal authentication. For these purposes the paleographer needs to be acquainted with the various substances, such as bark, leaves, skins, paper, etc., which have been used for writing; with the various manners of writing which have prevailed and the changes which they have undergone; with the various forms of authenticating writings, such as seals, signets, cachets, signatures, superscriptions, subscriptions, attestations, etc., which have been employed at different times with the various phases through which the grammar, vocabulary and orthography of the language of the writing with which he is dealing has passed; and with more or less, as the case may be, of the history, laws, institutions, literature and art, of the age and country to which the writing professes to belong.

Of ancient Greek and Roman written documents a certain number have come down to our time; and selections from these as well as from later manuscripts are used in this article to illustrate the sort of materials that form the subject matter of Paleography. These writings are, so far as the most ancient ones are concerned, on papyrus or on waxed tablets, while the less ancient documents are on vellum or on paper. (See Paper; Papyrus; Vellum). The tablets as used by the Greeks and Romans— called by the Greeks *deltoi, deltidia, ptyktoi, pinakes* and by the Romans, *tabulæ, tabellæ, pugillares, ceræ,* were usually of wood, but sometimes of ivory; they had a raised margin round the edges and the surfaces were covered with a thin layer of wax —hence the name commonly given to them by the Romans, *ceræ,* plural form of *cera,* wax: the Greek names all mean thin boards, tablets, and *deltos, deltidion,* furthermore indicate one of the original forms of such tablets — that of the Greek letter Δ. The tablets were used for temporary memoranda as we use slates; for use in schools they were usually strewn with sand, instead of being covered with wax. Two or more tablets held together by rings or other fastenings which served as hinges were termed by the Romans *caudex* or *codex* (block of wood), or, according to the number of tablets so held together, *ceræ duplices, triplices, quadruplices, quintuplices,* etc., book of two, three, four and five tablets); by the Greeks a two-leaved book of tablets was called *pinax triptychos, tetraptychos, pentaptychos* and so on.

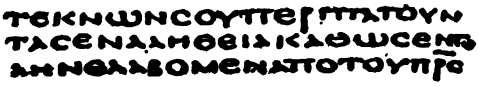
The history of Greek Paleography, so far as it can be written from extant materials, begins with B.C. 3d century and ends with the close of the 15th century and the introduction of the art of printing. During that period Greek handwriting is seen to have passed through two phases — that of the uncial or large letter and that of the minuscule or small letter; the beginning of the 9th century marks the time of transition, though naturally survivals of the antiquated unical letters may be noted in documents long subsequent to the year 800, and on the other hand anticipations of the minuscule not a few are seen in manuscripts dating from an earlier period. Both the uncial and the minuscule are seen in two styles — the set, or more formal, and the cursive. The difference between the capital letters and the uncial is no doubt a result of the difference in the materials upon which the inscriptions were made. When the letter E (epsilon) was to be carved on stone or bronze, it was manifestly easier to give it that form than the uncial form Є; the same is to be said of Σ(σ, ς) and Ω (ω); but in writing with a style on a waxed tablet, or with a reed or a quill pen (the use of the latter can be traced no farther back than the 6th century) on papyrus or parchment, the uncial form is the more convenient; and as the transition from capitals to uncials was due to the difference of materials on which the inscription was made, so no doubt the change from uncial to minuscule is, at least in part, due to the general use of vellum and later of cotton and linen paper.

The earliest examples of Greek uncial writing extant have been discovered in Egypt and in the ruins of Herculaneum and they are on papyrus. Those from Herculaneum are certainly of a date not later than A.D. 79, when the town was destroyed; probably they were all written during that century. Of the papyri from Egypt there are a few whose downward date-limit is accurately ascertained. The earliest Greek manuscripts extant were discovered at the village of Kurob, Egypt, by Flinders Petrie, of the University of Dublin, 1890. These are of a date certainly prior to B.C. 235, and comprise fragments of classical writings and records of a probate court, some dating from the reign of the 2d Ptolemy, the rest from the reign of the 3d Ptolemy. Of the handwriting of these documents Professor Mahaffy of Dublin says that it «varies from large, clear, splendid writing to the most fugitive and illegible cursive.» Prior to Petrie's discovery the most ancient Greek manuscript document extant was an astronomical work entitled 'Εὐδόξου τεχνή,' now in the Louvre collection. This has, written on the back, deeds bearing dates equivalent to B.C. 160; the writing is in set uncials of simple style, executed with a fine light stroke, without exaggeration of forms in the letters; in these respects it seems a fair type of the writing in vogue during the second or third centuries preceding the Christian era. In a tomb near Monfalat was found, 1849, a fragmentary papyrus containing portions of the 'Iliad'; it dates from not later than B.C. 1st century; the text is in slender uncials, very regular. The Louvre collection contains also fragments from the 'Iliad,' which date from perhaps the 2d century of our era. A fragment of poetic lines, supposed from the lost Temenides of Euripides, together with a few lines from the Medea, is in the private library of Firmin-Didot, bibliopole, of Paris, the date of which is not later than B.C. 161, a document of that year having been added. One of the most important discoveries hitherto made of Greek papyri in Egypt is that of one containing two orations by Hyperides, now in the British Museum; it is a roll, 11 feet long, in unusually good preservation. The writing is elegant, in set uncials, which, however, are often linked together without raising the pen; this document is certainly not more recent than B.C. 1st century. The Herculaneum Greek papyri are usually written in neatly-formed and regularly-spaced uncials.

Of tablets inscribed with Greek uncial writing, very few have come down to us. There are two in the British Museum. These are from Memphis and on one are traced some verses in large, roughly-formed letters, whose date can only be conjectured to fall within the 1st century of our era. In the Cabinet des Medailles at Paris is a set of five tablets on which are scribbled alphabets; also, in a more current hand, a contractor's accounts. Finally, a tablet from which the wax is worn has inscribed upon the wood characters in ink: it dates probably from the 4th century.

The firmer and smoother surface of vellum favors a more exact style of writing and a firmer hand, but no Greek manuscript on vellum of a date earlier than the 4th century is known to exist. The earliest examples of manuscripts on vellum are the three famous codices of the Bible and of these the conjecturally most ancient — the Codex Vaticanus is probably of the 4th century. The writing, in its original condition, must have been very perfect as a specimen of penmanship but nearly the whole of the text has been traced over by a later hand, probably in the 10th or 11th centuries, a small number of words only being left untouched. Written in characters of uniform size, without enlarged initial letters, the manuscript has all the simplicity of great antiquity. The Codex Sinaiticus (q.v.) bears the same tokens of antiquity and is by its discoverer, Tischendorf, judged to be older than Vaticanus, but the writing of Sinaiticus is not so pure as that of Vaticanus and if that is a criterion of age, Vaticanus is the older. The Codex Alexandrinus (see ALEXANDRIAN VERSION) is referred to the middle of the 5th century; it has enlarged letters at the beginnings of paragraphs; the writing is more elegant than that of Sinaiticus. In all three codices we find simplicity and regularity the leading features; the round letters are formed in symmetrical curves; Є C, etc., finishing off in a hair-line, thickened at the end into a dot; horizontal lines fine, those of Є *H* and Θ being either in the middle or high in the letter; the base of Δ and the cross-stroke of Π also fine, and as a rule, kept within the limits of the letters and not projecting beyond,

From the 5th century there have come down to us fragments of an illustrated Homer, in which the writing is somewhat taller than in the three codices, the cross-stroke in Є is abnormally low down, the stem of *P* (Rho) is not produced below the line. To the same century is probably to be referred also the palimpsest Codex Ephræmi, an incomplete New Testament with the letters imperfectly erased, and homilies of Ephræm Syrus written over them (see PALIMPSEST); the Octateuch, whose leaves are divided between Paris, Leyden and Saint Petersburg; the illustrated Genesis in the Cottonian Library; and the Dio Cassius of the Vatican.

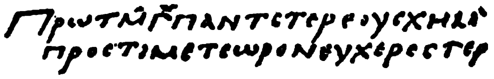


Greek Uncial (Cod. Alex.), 5th Century.

(τεκνων σου περιπατουν
τας εν αληθεια καθως εντο
λην ελαβομεν απο του π[ατ]ρ[ο]ς).—2 John 4.

The uncial writing of the 6th century shows signs of degeneration in larger characters, more heavily formed and not so completely written, cross-strokes in such letters as *A*, Δ, Π, Τ, produced and terminating in heavy points. The *Dioscorides* at Vienna is the type of the 6th century uncial writing. Other manuscripts of the 6th century are a palimpsest Homer and palimpsest fragments of Luke, with Syriac text written above both; palimpsest fragments of Matthew and Isaiah, at Dublin; fragments of the Pauline epistles from Mount Athos; a copy of the Gospels written in silver and gold on purple vellum the leaves of which are scattered among several libraries; fragments of the 'Eusebian Canon'; the Coislin 'Octateuch'; and the Vienna 'Genesis.'

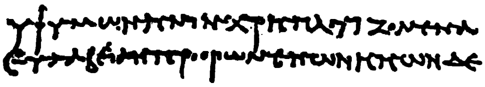
A new style of Greek uncial writing appears in the beginning of the 7th century, round letters becoming oval and the other letters laterally compressed; the writing slopes to the right, and accents and breathings are introduced. The slanting style continued in use through the 8th and 9th centuries. These characteristics (except the accents and breathings) are seen in the following facsimile of two lines from a mathematical treatise of the 7th century. In this manuscript the abbreviations are numerous.



Greek Uncial (Math. Treatise), 7th Century.
(*πρωτ (ον) (μεν) γ[αρ] παντ[ος] στερεον σχημ[ατος] προς τι μετεωρον εὐχερεστερ—*)

A papyrus in the Imperial Library, Vienna, of A.D. 680, bears signatures in slanting uncials; and the same style is seen in other manuscripts of the same and of later date. In an 8th century manuscript, the Venetian Old Testament codex, are a few lines in round uncials, but in a style so labored as to prove the discontinuance of that form of writing. Toward the end of the 9th or the beginning of the 10th century, the minuscule writing was well established and the uncial was in disuse, except for church-service books. The uncial character having thus become in some degree a "sacred" form of handwriting, the tendency was at once toward conservatism, i.e., strict retention of the forms once adopted and reversion to antique forms, rather than progress in new directions. In this way the sloping uncials become again more upright and rounder.

The cursive uncial writing is seen in papyri discovered in Egypt, and now deposited in the principal libraries of Europe. Till Flinders Petrie's discovery, the most ancient example of the cursive style known as extant was a collection of documents penned by Ptolemæus, a Greek, who became a recluse devotee in the temple of Serapis at Memphis about B.C. 173. A fairly continuous series of writings exists, illustrating the changes in cursive uncial handwriting for several centuries. For the earlier period the papyri are supplemented by the ostraka, or potsherds, on which in Egypt, under the Roman Empire, were written publicans' receipts for payment of taxes, etc. A few waxen tablets also remain to show the style of early Greek cursive writing.

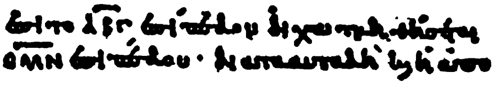


Greek Cursive, 163–162 B.C.
(*υφ υμων ημιν χρηματιζομενα εὐλαβειαν προορωμενων ημων δε*)

In the above specimen the letters are erect and written with great exactness; in successive centuries they are written with less precision and more sloping. Then, there is more combination of letters, and that necessarily leads to essential changes in the form of the letters themselves, those suffering changes which most readily combine with others. To this class of letters belong to the *A, E, T, P* (i.e., the Greek character for our *R*), Π and Δ.

The minuscule letters were a natural development of the cursive uncials; they are the source of the lower-case Greek characters at present used in print. But in the process of change from uncial cursive to minuscule, there were some curious transformations. For example, the three letters *B, H, K,* which in their uncial as in their capital forms are quite distinct, had, in the early minuscule, shapes not readily distinguishable from one another; and it is worthy of note that our present lower-case Greek characters *β, η, κ,* are descended from uncial rather than from these early minuscule forms.

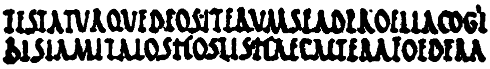
It is different with other minuscule characters, e.g., *μ, ν, θ, δ, σ, π,* which have undergone very little change since the 9th century. This will appear from the following specimens; which, however, exhibits the letter *η* in a form that has not been perpetuated. It is like the present lower-case *η* turned upside down, but it is, as *η* is not, a legitimate minuscule modification of the capital *H* (the Greek letter *eta*):



Greek Minuscule (Euclid), 888 A.D.
(*επι το* $\overline{\text{ΑΒΓ}}$ *ἐπίπεδον διχα τμηθήσεται*
$\overline{\text{ΟΜΝ}}$ *επιπέδου· δια τα αυτα δὴ κ[αι] ἡ ἀπο*)

See below in the Pompeian *graffiti* the form of the letter *H.* In this manuscript is seen also the disused form of *K,* and the reader will notice how closely it resembles *η.*

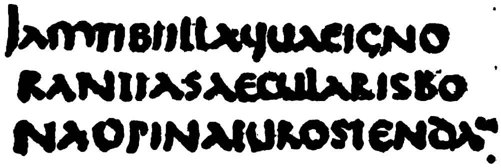
Latin Writing.— No ancient Greek writing in capital letters is extant. The use of capitals for book-writing, if ever it existed among the Greeks, ceased prior to the date of the most ancient papyri that we possess. It is different with the Latin. Specimens of very ancient Latin writings exist in which the letters all are capital, and there are two styles of ancient Latin capitals — the "square" and the "rustic." The difference between these two is, that in the former the horizontal lines are at right angles with the vertical strokes, as in our capital types; while in the rustic there is less regularity in that and other respects, as appears from the following specimen. Rustic capitals, being more convenient in shape, were in more general use, and most of the manuscripts in capitals which have survived are in this character.



Roman Rustic Capitals (Virgil), 3d or 4th Century.
(Testaturque deos iterum se ad prœlia cogi
Bis iam Italos hostis haec altera fœdera).

The earliest specimens of the rustic hand extant are the papyrus rolls recovered from the ruins of Herculaneum which must necessarily date from a time prior to A.D. 79. Vellum manuscripts in this hand are executed with great precision. The large scale of the writing and the extensive surface of a costly material covered by it must have made works written in rustic capitals very high-priced. There are in the Vatican Library two copies of Virgil written in this style, neither of them probably older than the 3d or 4th century. No manuscript in square capitals is extant of date earlier than the end of the 4th century, the oldest being portions of a Virgil, in the Vatican and at Berlin. Next in date, but much more recent, seem to be the Virgilian fragments at Saint Gall.

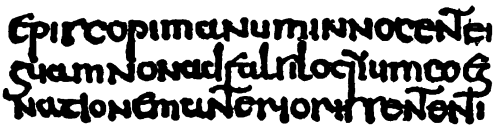
Latin uncial writing differs from the capital in the rounded forms of A, D, E, H and M, as seen in the accompanying specimen, except that here the bow of the A is in most places "blind." Another point of difference is, that in the uncial some of the letters rise above or fall below the line. The earliest specimens extant belong to the 4th century and in them the writing is so well established that we may believe it to have been already practised for generations. Uncial writing persisted as an ordinary book-hand, till in the 8th century it was supplanted by the reformed small writing of the Carlovingian school. Examples of uncial writing are the Vercelli 'Gospels,' a palimpsest Cicero 'De Republica' in the Vatican, and a fragment of a commentary on an ante-Hieronymian text of the Scriptures at Fulda. All of these are of the 4th century. From the 6th century are the two codices of Livy, at Paris and Vienna, and the Gaius at Verona.



Latin Uncial, 5th or 6th Century.

(Iam tibi illa quæ igno
rantia sæcularis bo
na opinatur ostendam).

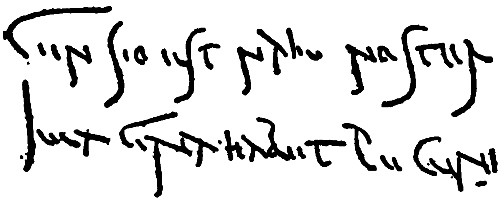
Between uncial and cursive lies the style "half-uncial." Apparently as early as the 4th century a set style of small writing was in use, which partly followed in its formation the characters of Roman cursive writing, while in some of its letters it retained the uncial forms. It appears in marginal notes on some early manuscript. But beginning with the end of the 5th century there is extant a series of manuscripts written wholly in this hand. In the specimen here given the B, D, M, N, R and S are seen to approximate in form to the same letters in Latin minuscule writing. The agreements with uncial are patent.



Latin Half-Uncial, 509-510 A.D.

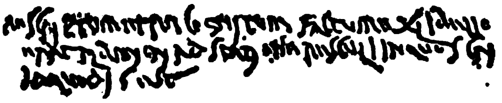
(episcopi manum innocente[m] —
[lin]guam non ad falsiloquium coeg[isti] —
nationem anterioris sententi[æ] —).

Of Roman cursive writing we possess specimens dating from the 1st century of our era. In a box unearthed, 1875, in the house of L. Cæcilius Jucundus, at Pompeii, were found 27 *libelli* or waxen tablets containing records of various legal transactions; and at different times, 1786–1855, 25 other waxen tablets, some dating from A.D. 131, were found in ancient mines at Verespatak (anc. Alburnus Major, in Dacia). In both sets of tablets the writing is much alike, and the forms of the letters resemble those of the more cursive *graffiti* found on the walls of Pompeii.



Roman Cursive (Graffiti), 1st Century.

(censio est nam noster
magna habet pecuni[am]).



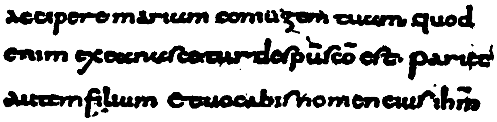
Roman Cursive (Dacian Tablet), 167 A.D.

(descriptum et recognitum factum ex libello —
erat Alb[urno] majori ad statione Resculi in quo scri —
id quod i[nfra] s[criptum] est).

In this early cursive hand are seen the beginnings of minuscule writing. The slurring of the strokes, whereby the bows of the capital letters were lost and their more exact forms modified, led the way to the gradual development of the small letters. The letter A is formed by a main stroke supporting an oblique cross-stroke above it; so too P and R having lost their bows, and F, throwing away its bar, are formed by two strokes placed in relatively the same positions, but varying in their curves. The main stroke of B dwindles to a slight curve, and the two bows are transformed into a bent stroke or loop to the left of the long stroke, so as to resemble our script d. This form of B persists in cursive writing till the 6th century. The D resembles the uncial form of that letter; the E is represented by the old form || found in inscriptions and in the Faliscan alphabet. The G in the Dacian tablet shows the first outline of the g of later writing; in the *graffiti* the H, by losing the upper half of its second upright limb, comes near to being the small h. In the Pompeian tablets (as also in the *graffiti*) M has the four-stroke form. In the Dacian tablet it is a rustic capital, almost an uncial M. The O is formed by two strokes almost like a.

From the date of the Dacian tablets to the 5th century no specimens of Roman cursive writing exist. Fragments of two imperial rescripts in cursive writing on papyrus are extant, in which are seen the same characters as in the Dacian tablets, with certain differences and modifications; but they are even more difficult to read than the latter. The same is to be said of another fragment dating from 572.

Roman writing of the different styles — capital, uncial, half-uncial and cursive — became known to the Western nations and formed the basis of the different national styles of writing known as the Lombardic, the Visigothic and the Merovingian. An important influence in determining the ultimate forms of our print and script characters was the reform of writing instituted by Charlemagne 789. The abbey of Saint Martin of Tours was the principal centre from which the reformation of the book-hand spread. In the 9th century the minuscule had attained a degree of elegance and clearness that left little to be desired, as appears from the following specimen:



Caroline Minuscules, 9th Century.

(accipere mariam coniugem utam quod enim ex ea nascetur de spiritu sancto est. Pariet autem filium et uocabis nomen eius Iesum).

From that style to our modern characters, whether script or print, was an easy step.

Paleography may be said to have been founded by the learned French Benedictine, Jean Mabillon, whose 'De Re Diplomatica' (1681, fol.; reprinted 1709 and 1789, in 2 vols. fol.) is still, perhaps, the most masterly work on the subject. With the 'Nouveau Traité de Diplomatique' (Paris 1750–65, 6 vols. 4to) of the Benedictines of Saint Maur, and the 'Eléments de paleographie' (Paris 1838, 2 vols. 4to) by M. Natalis de Wailly, is the great authority for French paleography. English paleography is perhaps less favorably represented in Astle's 'Origin and Progress of Writing' (London 1803) than Scottish paleography in Anderson's and Ruddiman's 'Diplomata Scotiæ' (Edinburgh 1739). Muratori treats of Italian paleography in the third volume of his great work, 'Antiquitates Italicæ Medii Ævi'; and among later works on the same subject may be mentioned 'Diplomatica Pontificia' (Rome 1841) of Marino Marini. The paleography of Greece is illustrated in 'Paleographia Græca' (Paris 1708) of Montfaucon. Spanish paleography may be studied in 'Biblioteca de la Poligrafia Española' (Madrid 1738) of Don C. Rodriguez. Of works on German paleography it suffices to name Eckard's 'Introductio in Rem Diplomaticam' (Jena 1742), Heumann's 'Commentarii de Re Diplomatica' (Nuremberg 1745), Walther's 'Lexicon Diplomaticum' (Göttingen 1745) and Kopp's 'Paleographia Critica' (Manheim 1817). Hebrew paleography has been elaborated by Gesenius in 'Geschichte der Hebraischen und Schrift' and other works. The great work on paleography generally — one of the most sumptuous works of its class ever published—is 'Paleographie Universelle' (5 folio vols., Paris 1839–45) of M. J. B. Silvestre.

Consult Mas Latrie, J. M. J. L. de, 'Dictionnaire de paléographie' (Paris 1854); Moore, M. F., 'Works Relating to English Palæography' (London 1912); Saunders, W., 'Ancient Handwritings: Manual for Students of Paleography' (Walton-on-Thames 1909); Silvestre, J. B., 'Paléographie universelle' (Paris 1841); Thompson, E. M., 'Greek and Latin Paleography' (London 1894); Thoyts, E. E., 'How to Decipher and Study Old Documents: A Guide to the Reading of Ancient Manuscripts' (London 1893); Wailly, J. N. de, 'Elements de paléographie' (Paris 1838); Quaritch, B., 'Catalogue of Manuscripts and Books Illustrating the Science of Paleography' (London 1893).

PALEOLITHIC PERIOD, The. The second period of prehistoric man is the Paleolithic (Greek, *paleos,* ancient, and *lithos,* stone), the first period being the Eolithic. In this stage of his development man made his implements of flint by chipping off flakes until the desired form was obtained, but as far as known he never polished them afterward, the art of polishing stone implements being introduced near the beginning of the Neolithic. It is on this basis,— the absence of polished stone implements in the deposits of the Old-Stone Age and their presence in those of the Young-Stone Age,— that the names Paleolithic and Neolithic are given. The makers of Paleolithic implements probably did not belong to a single race of men, but rather to several races. Of these races two seem to have been especially important: the Neanderthals, who lived during the older Paleolithic and the Cro-Magnons, who replaced them, and who seem to have been the dominant people of the younger Paleolithic. In general, it can be said that during the period under discussion man became progressively more dextrous in making stone implements and that toward its close, when bone and ivory were replacing stone, skill in working flints declined.

Proofs of Antiquity.— Great difficulty is often encountered in determining the age of the remains and implements of paleolithic man; many mistakes have been made and investigators have differed widely as to the interpretation of the same evidence. Nevertheless, when all the evidence is carefully studied, it is found that the broad outlines of the history of the Old Stone Age can be accepted, even though the details are sometimes in doubt.

The proofs of man's antiquity and the relative age of his remains and implements are determined by several lines of evidence:

(1) The association of his remains and implements with the bones of extinct animals is a convincing proof of man's antiquity when it can be established that these bones and tools were deposited at the same time. For example, in France, England, and elsewhere the bones of extinct elephants, rhinoceroses, lions, and other animals are found with the remains of man. In other deposits the arctic woolly rhinoceros, woolly mammoth, and reindeer are found with his skeletons and tools. These animals have long been extinct in the countries in which their remains are now found, and the climate in these countries has radically changed since then.

(2) The proof of the age of man's remains is also afforded by deposits in caves as the relative age of his implements and bones is shown by the superposition of the layers in which they occur. No one cave affords a complete record of the Paleolithic Period, but by piecing together the evidence from different caves the relative antiquity of cave deposits has been unraveled, so that it is now often possible to tell the age of the deposit from the stage of development of the implements, as well as from the animal remains. A single example, that of Kent Cavern, Devonshire, England, will suffice to illustrate this method of determining the relative age of deposits. As the material which partly filled the cavern was excavated, three distinct layers were encountered, in addition to two sheets of stalagmite, a rock formed by lime dripping from the roof of the cave.

(a) The surface was composed of dark earth containing mediæval remains, Roman pottery, and objects of iron, bronze, and stone, showing that man inhabited the cave at intervals from Neolithic to Roman times.

(b) Below this surface layer was a bed of stalagmite one to three feet thick. This covered a reddish deposit known as cave-earth, which contained a number of relics made of stone, bone, and horn. The flints were shaped into tools designed for various purposes. The bone implements were in the form of pins, awls, barbed-harpoons, and neatly formed needles. Associated with these implements were the bones of extinct animals, among which were fragments of the skeletons of the cave hyena, horse, rhinoceros, gigantic Irish deer, wild boar, bison, mammoth, cave bear, cave lion and sabre-tooth tiger. All of these animals are of species now extinct, not only in England, but throughout the world.

(c) The bottom of the cave was filled with broken fragments of rock (breccia) containing the remains of the cave bear, together with flint implements of a much cruder type than those in the layers above.

It is evident from this description that thousands of years were required for the filling of this cave. The bones of bygone animals that either had their lairs in the cave or whose carcasses were dragged there by ancient extinct carnivors is proof of the great antiquity of the lower deposits. The last of these animals, so far as we know, disappeared many thousands of years ago. The thickness of the stalagmite beds formed by lime drip is another evidence of the antiquity of the underlying deposits. A bed of stalagmite, one to three feet thick, probably required a very long time for its formation, although favorable conditioins might have caused a rapid deposition. The oldest of these deposits are many thousands of years old, but ancient as they are they were, nevertheless, laid down long after the ape-men had disappeared from the earth.

(d) In the valleys of the river Thames in England; or the Somme, Marne, and Seine in France; of the Inn in Austria; of the Rhine in Switzerland, and in the valleys of other European rivers are found series of terraces or benches. A careful study of these terraces shows that during glacial times the rivers flowing from the great ice sheets spread vast deposits of sand and gravel over the broad surfaces of their valleys. In many valleys these deposits were built to a height of 100 to 150 feet. Several times during the Glacial Period the ice sheets advanced, and at other stages, called interglacial, the glaciers practically or entirely disappeared from Europe and North America and the climate in these continents became warmer than it is at present. During these interglacial stages the streams flowing through the valleys are believed to have had smaller volumes and much less sand and gravel in proportion to the volume. Consequently they were able to cut into their ancient beds, forming narrower channels, through which they transported their own loads of sediment. In this way successive river terraces were formed, a descending series of gigantic steps along the sides of the valleys. In many valleys there are four of these terraces which correspond to the several glacial stages; in others there are only three terraces. In general "the high terraces" are the oldest ones. The coarse river gravels of the high terrace of the Eure, for example, contain remains of an extinct elephant and of an extinct horse, showing that these animals lived when a broad stream carrying coarse gravel flowed at least 90 feet above the present stream. It is in or on the gravels of the high, middle, and low terraces and underlying the materials later deposited on them that the artifacts of man are found. Along the river Seine the "high terrace," 90 feet above the present level of the river, corresponds to the first glacial stage, whereas the "low terrace" is only 15 feet above the river and was built of gravels deposited much later when the river was nearly of its present size. The "high terrace" contains the bones of animals of the first interglacial stage, but none of man nor of man's stone implements, whereas the lower terraces have yielded flints of prehistoric man and the bones of more recently extinct animals.

(e) During parts of the second and third interglacial stages, the climate of Europe was arid and the fine dust of the glacial deposits was swept up and transported by the wind until it slowly settled over the continent. The time at which these dust or loess deposits were laid down can be dated by the fossils they contain and also by the stage in the development of the flint implements embedded in the loess, and the loess, in turn, when its age is known on other evidence, gives the age of the human artifacts.

(f) The tools which man made were gradually improved as he acquired greater skill and had better models to copy. Consequently, the older implements are, in general, cruder than the later ones or of a different type. Such evidence must be carefully weighed, however, since the skilled worker of later times occasionally discarded a partially worked flint because of some flaw in the stone and sometimes lost a flint which had been merely roughly fashioned. Such crude, unfinished flints have sometimes led to the belief in a greater antiquity than they possess.

Climate.— Geological evidence points to the Glacial Period as the time when paleolithic man lived in Europe and Great Britain. The Glacial Period, or Great Ice Age, was not a period of continuous cold but, as has been said, included stages when the ice largely withdrew from the continent. These are called interglacial stages. It seems well established that the Great Ice Age in Europe consisted of four glacial and three interglacial stages, and that it was during the second or third interglacial stage,— more likely during the third,— that paleolithic man reached Europen.

The fossils of animals and plants found with the remains of very ancient men (Chellean and Early Acheulean) show that the climate was warmer at that time than it is now in England, France, and Germany. The southern mammoth (*E. meridionalis*), straight tusked elephant (*E. antiquus*), and soft nosed rhinoceros (*R. merckii*), hippopotamus, sabre-tooth tiger and hyena indicate that the climate was genial. The leaves of the sycamore, maple, willow and Austrian pine, found in deposits of the third interglacial stage near Paris, denote a temperate climate, and an increasingly milder climate is indicated by the presence of the box, fig tree, and canary laurel in slightly later deposits. The habit of these last two trees of flowering in winter shows that the winter temperature was not cold. The plants of still younger deposits (late Acheulen) show that the climate was again becoming colder. The increasing cold finally culminated in what is called the Fourth Glacial Stage. It was during this time of refrigeration that the men of the younger Paleolithic Period lived.

CLASSIFICATION OF THE PALEOLITHIC PERIOD.

Various classifications of the Paleolithic Period have been offered, each of which is based upon important principles. It has been divided into the Age of the River Drift Man and the Age of the Cave Man. These divisions rest on the observation that the implements of the earlier Paleolithic Period are more frequently found in the gravels of river terraces than in caves and that later ones are found chiefly in caves and rock shelters. As the animal and plant remains of the earlier Paleolithic indicate a genial climate, so the chief occurrence of older paleolithic implements on the terraces formed by the rivers of the time seems to signify that in this stage man lived principally in the open, probably protected only by crude shelters of bark, as did the recently extinct Tasmanians. As the climate became colder with the approach of the Fourth Glacial Stage, more adequate protection was sought and that afforded by cave and rock shelters common in portions of Europe was used. These caverns and rock shelters were inhabited at least during the colder parts of the year. It is evident, however, caves and rock shelters would be used not only when the temperature was cold but also that when the climate was genial: for example, as a place of refuge during rain storms or when attacked by wild beasts or human enemies.

If the Paleolithic Period is divided according to the races which lived at the time, the terms Older and Younger can be advantageously used, since during the Older Paleolithic (Chellen, Acheulean, Mousterian) Europe was inhabited by the brutish Neanderthal men with their broad, flattish skulls and ape-like postures. The men of the Younger Paleolithic (Aurignacean, Solutrian, Magdalenian) were represented by the Cro-Magnon race, characterized by great heads, large stature, and modern aspect.

Another classification is based upon the conspicuous animals of the various stages.

Epoch of the Reindeer — Magdalenian
Epoch of the Mammoth and Woolly Rhinoceros (R. tichorhinus)—Mousterian
Epoch of the straight tusked Elephant (E. antiquus) *and Merck's Rhinoceros* (R. merckii).

The classification now generally accepted is based both on the characteristics of the races and upon their culture. It is as follows:

Old Stone Age: Paleolithic Period
  Younger Paleolithic
    Azilian
    Magdalenian
    Solutrian
    Aurignacean
  Older Paleolithic
    Mousterian
    Acheulean
    Chellean
    Prechellean
Eolithic Period

Eolithic.— If man had suddenly appeared on earth in his present bodily and mental state it would perhaps be unprofitable to search for his beginnings, but such was not true. Man was evolved from lower animals and his skill in making stone implements was acquired slowly and laboriously. Because the ability to design and shape implements was of slow growth, it is evident that very early in his history the tools he used were those prepared for him by nature, such as he found in the river bed or in the shingle of the ocean shore. The difficulty of determining whether such fragments were intentionally broken by primitive man or were shattered by the forces of nature is evident. His requirements in the way of tools being very simple and the supply of material in the form of natural flakes and fragments of flint being very plentiful, the inventive powers of man remained dormant for ages. The stone hammer and the stone knife were the original tools. Both were picked up ready-made. A sharp-edged, natural rock fragment served for one, and a nodule or fragment served for the other. When the edge of the flake became dulled by use, the piece was either thrown away or the edge was retouched for further use. If hammer or flake did not admit of being held comfortably in the hand, the troublesome points or edges were removed or reduced by chipping. The stock of tools increased slowly with the slowly growing needs. As these demands multiplied and the natural supply of raw material diminished, the accidental flakes were supplemented by the manufacture of artificial flakes. The earliest stone implements are called *eoliths* and the period, the Eolithic period. It is a significant fact that in gravels of "the higher terraces" eoliths have been found but no true paleolithic implements. It is possible that Pithecanthropus (see MAN, PREHISTORIC RACES OF) was a maker of crude flint implements (eoliths) and probable that the Heidelberg and Piltdown men also made eoliths. Weapons and tools made from wood, however, without doubt, were the principal ones, just as they are with the gorilla to-day; but as they rapidly decay no trace of them remains.

Pre-Chellean Epoch.— Crude flint implements believed by some investigators to antedate the first well-established epochs of the Paleolithic (the Chellean) but to be subsequent to the Eolithic, are considered by others to belong to the Chellean. The general shape of the flint was due to chance and was adapted to a variety of purposes by crude flaking. It is possible that these stone tools were made by the Heidelberg and Piltdown races.

Chellean Epoch.— The first well-defined epoch of the Paleolithic is the Chellean, named for the village of Chelles on the banks of the Seine, about eight miles east of Paris, where many implements have been found in alluvial gravels which form a terrace. The Chellean culture also occurs at Saint Acheul near Paris, in England, and in Spain. In all of these deposits are found flints shaped by man in his early efforts to master his environment. As one would expect, these first attempts to fashion flints into implements are very crude, but it is evident at a glance that the workers were endeavoring to make tools of a definite form. The most distinctive implement of the

Chellean, as indeed it is of the next following epoch, has been given several names (coup-de-poing, boucher, faustkeil, hand-stone). The French term, *coup-de-poing,* which literally translated means «stroke of the fist,» is the one in most common use. «Hand stone» has been suggested as an English equivalent. This tool is roughly almond-shaped, varying from about 4 to 10 inches in length, and in size and shape is not unlike two hands with the palms touching. The form varies greatly from somewhat disc-shaped and oval to poniard shaped. It is a rather heavy tool which could be used for many purposes. A thick butt end fitted the hand and when held by this end it could be used for hacking or sawing, for drilling holes, for cutting and stabbing, for scraping hides, and for other purposes. When held by the pointed end it could be used as a hammer. If it had been used with a helve or handle the edges would have been chipped off by the violent blows it received, but the flakes produced by wear are minute and not coarse. The *coup-de-poing* was, in fact, the one indispensable, «all around» implement. The gravel deposits of Saint Acheul alone are said to have yielded 20,000 specimens. It was almost the sole implement used by the men of Chellean times. «It was the outcome of long experience, and, in point of utility, combined the functions of the elaborate array of mechanical tools which ultimately, under changed conditions of life, came into requisition.» (Munro). In fashioning *coups-de-poing* a large number of flakes were broken off. The shape of some of the flint fragments was slightly modified by breaking off a corner or an edge and in this way a variety of small, crudely-made tools were obtained.

In the course of time flint tools were made for special uses and the use of the *coup-de-poing* was consequently gradually discontinued. This development in the skill of working stone, however, was very slow and during the whole Chellean Epoch flint implements were crudely shaped.

No human skeletons of Chellean Age have been discovered. This is not surprising, as bones rapidy disintegrate when buried in gravels or left on the surface. The climate of France in this epoch was not very different from the present, as is shown by fossils of trees, leaves, and animals. Ancient elephants (*E. antiquus*), rhinoceroses (*R. merkii*), hippopotami and sabre-tooth tigers, however, indicate a slightly warmer climate than now prevails in the same region.

During Chellean times Europe extended far beyond its present limits, the English Channel did not separate England from France, and Ireland was joined to England. Spain was connected with Africa at Gibraltar, and Italy and Sicily were also joined to that continent. As a result of these land connections the Mediterranean then consisted of two inland lakes.

Acheulean Epoch.—Acheulean implements have been found in at least 30 localities in France, England, Spain, Portugal, Italy, Germany, Austria, Russia, and Poland. In fact, the Acheulean workers probably lived in all that portion of Europe not then covered by the great ice sheet. The name Acheulean was given to the epoch because the industry of the time is typically represented in the gravels of the third terrace of the river Somme at Saint Acheul, France.

The implements manufactured by the men of Acheulean times are merely modifications of the Chellean. The *coup-de-poing,* or hand-stone, is more skilfully made and, with few exceptions, the entire surface is flaked, whereas in the Chellean stage a part of the surface of the nodule is retained. It is, in general, lighter than the older tool; and the edge, as a result of repeated chippings, is much better adapted for cutting. It is, however, not always easy to distinguish between the implements of the two epochs. In addition to the *coups-de-poing* are found planing tools, knives, drills, scrapers, and other artifacts whose use can merely be conjectured. It has been stated that from the beginning to the end of the Chellean and Acheulean there is not an implement that can be regarded as a weapon (Sollas). The explanation, apparently, is that the spears were made exclusively of wood as were those of the recently extinct Tasmanians. It has also been suggested that it was only after men began to live in caves that they took to hunting big game (Munro).

A large number of fragments of human bones and several entire leg bones were found in a recess in the banks of the Krapinica Brook, in Croatia, but there is doubt as to the age of these remains. Some investigators consider them to belong to the Acheulean epoch and others to the Mousterian.

During the greater part of the Acheulean epoch the animal life was practically the same as in the preceding epoch: the straight-tusked elephant, Merk's rhinoceros, a horse which is believed to be the ancestor of some of our modern draft horses, the hippopotamus, and other animals abounded. Besides the common Chellean animals were hyenas, brown bears, wild boars, and lions. Some of the lions and hyenas are ancestors of the cave types which appear in the succeeding Reindeer and Cavern epochs, i.e., in the Younger Paleolithic.

The climate of the earlier Acheulean, as shown by animal and plant fossils, was warm. This is also indicated by the distribution of the Acheulean camps which are, for the most part, in the open country on the divides between rivers and on river terraces. Later in the epoch a colder, dry climate is indicated by the plants preserved in the travertine of La Celle-Sous-Moret, near Paris. It is possible that before the close of the epoch the continental ice sheet of Scandinavia began to move southward. Some Acheulean implements are said to be associated with the remains of the woolly rhinoceros and mammoth, but this association does not necessarily prove that the climate in the vicinity of the river Somme was cold, but may indicate instead that these animals, whose natural habitat was near the front of the ice, at certain times roamed southward and mingled with warm temperate animals. That the climate in northern France was arid at times is proved by the presence of layers of wind-blown dust or loess, which cover the terraces of the rivers of northern France, southern Germany, and Austria.

Mousterean Epoch.— Because of the colder climate of the Mousterean epoch the folk of that time were forced to spend a portion of the year in caves and rock shelters; for this reason their implements, hearths, remains of feasts, and their skeletons are preserved in much greater abundance and perfection than are those of the men of the preceding epochs. During the warm summer months they lived in the open country, as is shown by the occurrence of their implements in loess (dust) deposits and river gravels. Their remains occur in many places in Europe south of Scandinavia, the latter country being largely covered by the ice sheet of the fourth glaciation. Asia Minor also contains deposits of this epoch.

The name Mousterean was given to this epoch because of deposits found in the floor of a cave and under the cliff in front of it, at Le Moustier, on the Vézère River in southwestern France. There seems to have been a continuous residence in this cave during upper and middle Mousterean times and also during a part of the following (Aurignacean) epoch.

The Mousterean stone implements are modifications of those of the Acheulean but are superior in workmanship, variety, and design, and they were evidently made by the lineal descendants of the makers of the Acheulean implements. A change to a colder climate seems to have been the compelling cause for the improvement in the implements and the explanation for the little progress in the manufacture of stone tools in Acheulean times is ascribed to the sub-tropical climate which offered little incentive to exertion. When the climate became colder Mousterean man was compelled to leave the open country and seek such natural shelter as he could find, and so became a cave-dweller, a troglodyte. He was compelled to provide his body with some kind of clothing or freeze; the easily gathered and abundant fruits no longer supplied him with food and he was forced to hunt and having secured flesh to cook it. Necessity then required him to make tools of new design and better construction and some form of social organization must have arisen as the result of the living in caves. The *coup-de-poing*, or hand-stone, was still used, but this "all around" tool was gradually supplanted by implements designed for special purposes. A new method of manufacture, called the Levallois flaking, soon caused the disappearance of the *coup-de-poing*, because implements made in this way were lighter, had better cutting edges, were made with less labor, and served equally well many of the purposes of the older implement. The Acheuleans shaped the *coups-de-poing* from a nodule of flint by chipping off bits with a hammer stone until the desired form was obtained, but they had also learned to make the Levallois flake which was produced by breaking off a large flake so as to form one smooth, slightly convex surface. In preparing a nodule from which to manufacture the Levallois flake, the nodule was first dressed to the desired shape; then with a sharp blow a flake was detached which was later trimmed to final form. In Mousterean times this method of manufacture was perfected and Levallois flakes six to seven inches long and two inches wide were made. From similar flakes a variety of implements were made; one of these, the Mousterean point, rarely four inches long, was carefully retouched so as to form a sharp point. The Mousterean point was probably used for cutting, piercing, and scraping hides. Scrapers of various kinds, awls and, for the first time, lance heads were also made. Spherical balls of limestone have been found which were probably used for bolas. Crudely made bone implements seem to have been manufactured in this epoch, but they are little more than bone fragments whose accidental shapes were useful.

A number of fragmentary skeletons of the makers of Mousterean implements have been unearthed and it is now possible to give an accurate description of the men of that time. The race is called the Neanderthal Race from a cave in a small valley of that name near Düsseldorf, Germany, where a skull of this race was unearthed. Remains of Mousterean men from at least 20 localities have been identified. These skeletons are all of men of one type; with large, broad, flat heads and strong jaws and teeth. (See MAN, PREHISTORIC RACES OF). The remains of Neanderthal men have been found only in caves but their implements have been discovered in terrace deposits indicating that they lived in the open during favorable weather.

The animals most characteristic of the Mousterean epoch are the mammoth, woolly rhinoceros, and the reindeer. The long hair which reached almost to the ground and the thick, soft, under-coating of fur shows that the mammoth was well adapted for a severe climate. (The food found in the stomach and mouth of frozen Siberian mammoths consisted of grasses, sedges, beans, and arctic crow-foot. In the winter the leaves and branches of small trees and shrubs were also eaten). The woolly rhinoceros (*R. trichorhinus*) was also protected by long hair and a thick under coating of fur. Besides these larger animals there were arctic foxes and hares, the banded lemings and others. The occasional discovery of the remains of the straight-tusked elephant and Merck's rhinoceros indicates that either in the warm summer months or during intervals of warmer climate these southern animals migrated into Europe from the south.

The evidence from the character of the fauna and floras as well as the fact that man lived in caves instead of in the open during the greater part of the Mousterean, points to a severe climate which forced man from the open plains to such natural shelter as he could find.

The best evidence at present indicates the fourth glacial stage as the time in which the Mousttereans lived. It is estimated that the Mousterean epoch lasted about 30,000 years and closed about 25,000 years ago (Osborn).

Geography.—The geography of Europe during Mousterean times differed somewhat from that of to-day. Scandinavia was covered with an ice sheet which extended a short distance south of the Baltic Sea, and England, for a time at least, was joined to France.

Aurignacean Epoch.—The older Paleolithic includes the pre-Chellean, Chellean, Acheuleans and Mousterean, and is succeeded by the younger Paleolithic, of which the first epoch is the Aurignacean. With the older Paleolithic, the Neanderthal race disappears and a new race or races of men appear, differing from it in physical appearance almost as much as the Neanderthals differed from the ape-man. The kinds of animals, however, remain nearly the same, although their relative abundance varies somewhat at different times. The reindeer was common and because of its constant association with the remains and implements of younger Paleolithic man this division is often termed "the Reindeer Period." The horse, bison, cave bear, and cave lion, as well as other animals, were also living in the regions occupied by man in Europe. In Italy the Aurignacean seems to have been the only younger Paleolithic culture.

The love of personal adornment is shown in the perforated sea shells and back bones of fishes for use in necklaces, perforated teeth of various animals and beads made from ivory and reindeer horns which he wore. Bone tubes which served as flasks for pigment were made from the cannon bones of the reindeer.

Aurignacean man was the first to use bone to any great extent for making tools. From this material he made such implements as pins, chisels, and shaft-straighteners (first called *baton de commandements*). With him art seems to have had its beginning.

There was a marked improvement in the workmanship of the flint implements of this stage. One important flint was the graver (burin) used for making incisions in hard materials, such as stone, bone, horns, and ivory. Side scrapers (racloirs), end-scrapers (grattoir), flints shaped like a knift blade (chattelperron-point), spoke-shaves and tools of other designs were made. Figures in outline of horses, bisons, rhinoceroses, elephants, stags and oxen represent crude attempts at art, but in some specimens the drawing is excellent.

During Aurignacean times the English Channel was not in existence and man could walk from France to England or Ireland without crossing any natural barrier, other than rivers. The Baltic Sea was reduced to a fresh water lake. During this epoch the climate in western Europe became dryer and less severe than it was in Mousterean times as is shown by deposits of loess.

Horses were abundant and were killed and eaten but, as far as known, they were never domesticated. Around one Aurignacean camp (Solutré) the bones of not less than 100,000 horses have been found. In this bone breccia remains of the reindeer and mammoth have also been unearthed.

The superb Cro-Magnon race appeared at the beginning of the Aurignacean and at about the same time the Neanderthals disappeared. It is probable therefore that the extermination of the latter was brought about by these new arrivals. Skeletons of the Cro-Magnon race have been found in France, Wales, Italy, Spain, and Austria. They were very tall men with an average height of six feet one and one-half inches and their brain capacity was larger than that of modern man.

Solutrean Epoch.— The Solutrean industry has an unexpected distribution in that it is not found in the lands bordering the Mediterranean. The artifacts of the epoch have, however, been found in England, France, Germany, Hungary, Bohemia, and Poland.

The Solutrean epoch is characterized by extraordinary skill in the manufacture of flint implements. At no other time in the Paleolithic was the fashioning of implements from flint so admirable. The most perfect of these flints are laurel-leaf and willow-leaf spear heads. These implements are evenly flat and remarkably thin, so thin in some specimens as to be translucent; but the character which especially distinguishes them is the beauty of the secondary flaking (Solutrean retouch). In this process thin flakes were split off with great regularity, leaving long, shallow furrows which run from the edge of the implements up toward the middle; both sides of the laurel-leaf points have been dressed all over in this way.

Art which had such a promising beginning in the Aurignacean epoch was at a standstill, or even declined during the Solutrean epoch. The use of bone and ivory, however, continued, and bone and ivory arrow straighteners, spear points, awls, the first bone needles, and some primitive drawings and statuettes were made. The frequent occurrence among their remains of lumps of ochre and graphite shows that colors were used either for personal adornment, as was customary with the American Indians, or for paintings on the walls of caves. The sudden appearance of implements with the "Solutrean retouch" suggests that possibly a new race had invaded Europe. That this is probable is further shown by the discovery of a few skeletons (Brünn race) whose skulls are different from those of the Cro-Magnon race, and which are of as low a racial type as that of the Australian negroids. The skulls are unusually long for their width. This race did not drive out the Cro-Magnon race, but lived in Europe at the same time and from it the Cro-Magnons appear to have learned how to manufacture the beautiful Solutrean spear-heads. One possible cause for the lack of progress of art during this epoch is the slight amelioration of the climate which permitted man to live in the open, and, consequently, the incentive of the cave dweller for drawing and carving was lacking.

Magdalenian Epoch.— The culture of the people of the Magdalenian is so unlike that of the preceding epoch that it is difficult to understand how the high art of this epoch could have been made by descendants of the Solutreans. Instead of beautifully made flint implements, the inhabitants of the Magdalenian caves manufactured stone implements of inferior workmanship and often of poorly selected stone. But the lack of a highly developed flint industry was fully compensated for by tools made of bone, horn, and ivory. A great variety of new kinds of tools and ornaments of bone was soon invented and the skill in the manufacture of bone is as surprising as the lack of skill in the working of flints. In the early Magdalenian the bone implements were similar and less varied than later in the epoch. The bone implements most commonly found are spear-heads, which at first were without barbs, but later were made with a double row; bone spear throwers, shaft straighteners, and bone fish hooks. Bone needles were beautifully made and were much superior to those of later times. "The Romans, for example, never had needles comparable to those of the Magdalenian epoch." (Lartet).

The art of Magdalenian times attained a high degree of development. This is seen in carvings of animals on bone and ivory; in engravings on bone, on slabs of stone, and especially on the walls of caves and rock shelters.

The culmination of Magdalenian art is probably that found on the roof of the cave of Altamira in northern Spain, where a large number of figures, some of which are of life size, colored in black, red, yellow, and polychrome, representing bison, horses, deer, and other animals are found. The drawing is of a high order and could not have been executed by any but skilled artists.

It is probable that the Cro-Magnon race was the dominant one during the Magdalenian epoch, and that they were the artists of this time. More than 30 kinds of animals were portrayed by the artists and sculptors of this epoch and it is not surprising, perhaps, that the more impressive of them, such as the mammoth and bison — though perhaps not the most abundant — were favorite subjects. Besides these animals they drew or engraved the outlines of the rhinoceros, the horse, the ibex, the lion, the bear, and the deer. A few figures of women have been discovered but figures of men were rarely and crudely portrayed.

Azilian Epoch.— The Paleolithic period closed with the Azilian epoch. Instead of a form of art higher than that of the Magdalenian, better carvings, and tools of superior workmanship, such as one would expect, there is a deterioration in art and flint working. «With the advent of Azilian the realistic art of the Magdalenians disappeared and is succeeded by rude attempts at geometrical or generalized representations. There is no working in ivory; this material has disappeared with the mammoth, and stag's horns take its place» (Sollas).

Numerous pebbles have been discovered which are painted on one side with various designs; dots, parallel lines, ladder-like patterns, forms which resemble the capital letters F, E, I, and other designs. What these symbols signify is not known.

The cause of the abrupt change in culture between the Magdalenian and Azilian, which has been characterized as a revolution rather than a development, is explained on two theories. The discovery in the deposits of the epoch of skulls of two different types, one extremely long headed and the other extremely short headed, is considered to indicate the possibility that the Azilian culture was introduced by new races and was not a development from preexisting European cultures. It is also suggested that the Azilians no longer lived in caves but in the open country and that, consequently, art practically disappeared. Moreover, the disappearance of the mammoth and reindeer from Central Europe cut off the supply of ivory and reindeer horns and man was forced to use the greatly inferior stag horns for making harpoons and tools. Azilian men, like their predecessors, knew nothing of pottery and they had no domesticated animals or plants.

The Azilian epoch seems to have occurred at the very close of the last Glacial Stage as is shown by the absence south of Belgium of the reindeer, arctic fox, and arctic hare. The common animals were those of the present day, such as wild boar, wild cattle, roe deer, rabbit, brown bear, and field mouse. The Azilian culture had a wide distribution in Europe and has been identified in Scotland, England, France, Germany, Austria, and Spain. The Paleolithic is believed to have closed 7,000 to 10,000 years ago and was followed by the Neolithic period (q.v.).

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PALEOLOGUE, pą'lā'ō'lōg', **Maurice,** French diplomat and author: b. Paris, 1859. He was employed in various capacities in the Department of Foreign Affairs and was sent on diplomatic missions to Bulgaria, China, Korea and other countries. He has written several works mostly dealing with literature. They include ‹L'art chinois› (1888); ‹Vauvenargues› (1889); ‹Alfred de Vigny› (1892; 3d ed., 1908); ‹Profils de femmes› (1895); ‹Sur les ruines› (1897); ‹Le cilice› (1901); ‹Rome, impressions d'histoire et d'art› (1902); ‹La cravache› (1904); ‹Le point d'honneur› (1907); ‹Dante son caractère et son génie› (1909).

PALEOMASTODON, a genus of primitive elephants fossil in the lower Oligocene beds of the Fayoum, Egypt. The species varied in size from that of a tapir to that of a half-grown elephant and their frames and limbs were rather lightly built. The reduction of the dentition and certain other features point to still more primitive ancestors. The neck was relatively long, the skull long and narrow, having a high and crested occiput, and the front projecting into a long snout. Both jaws contained short, partly enameled tusks, those of the upper jaw curving downward somewhat divergently, and those of the lower jaw pointing straight forward.

PALEOMETEOROLOGY. See PALEOCLIMATOLOGY.

PALEONTOLOGY, the science of the ancient life that inhabited the earth during the vast periods of time which have antedated the age of man. This science dates back only to the beginning of the 19th century, when William Smith, Cuvier, Brongniart, Lamarck, Blumenbach and Schlotheim initiated the study of fossil life as a distinct branch of scientific research. It was christened «palæontology» by de Blainville and Fisher von Waldheim in 1834. Erroneous and fantastic ideas regarding the nature and origin of organic fossils had prevailed till the last decade of the 18th century, interesting accounts of which, as well as of the later history of the science, may be read in the works of Zittel, Lyell, Marsh and Weller. Since the early days this science has made rapid progress until now its devotees are numerous, and they attempt to solve some of the most important problems bearing upon the origin and evolution of organisms, and upon the ancient life-history of the earth. The study of palæontology is carried on by means of fossils (q.v.) which, defined in the words of Zittel, are "all remains or traces of plants and animals which have lived before the beginning of the present geological period, and have been preserved in the rocks," and hence the successful pursuit of this science is in large degree dependent upon intimate knowledge of the closely allied sciences, geology and biology. This affiliation of palæontology to the two sciences mentioned is easily traced in the literature. The early works were descriptions of fossils, often arranged, as in Sowerby's 'Mineral Conchology,' 1812–45, without reference to their biological classification or to their relation as members of the fauna of a particular formation. In later works the tendency to diverge along two distinct lines is very apparent and at the present day we have two more or less widely separated schools of palæontologists: (1) those whose work is more intimately associated with that of the geologist; and (2) those who are essentially biologists. The former (stratigraphers, palæontologic geologists, geological biologists) are more interested in unraveling the relations of fossils to the rocks in which they are found entombed, in studying the order of succession, the evolution, the migration of fossil faunas in the stratified rocks, in developing the use of index fossils, that is, of particular genera and species of fossil plants and animals as indicators of particular geological formations; and, by the study of the geographic distribution of fossil faunas, in solving the problems of "facies development," and of palæogeography or ancient physical geography. The second group of palæontologists confine their attention almost wholly to description of the morphology, embryogeny, and phylogeny or genealogy of fossil organisms, and give only incidental notice to the geologic associations of the fossils they handle.

Palæontology has been of great aid to zoology and botany in clearing up mooted questions of classification, in explaining the origin of various obscure structures seen in modern plants and animals, and in adding to our knowledge of the determining factors of geographic distribution. The strictly utilitarian side of palæontology, involving the application of a knowledge of index fossils to determination of the proximity of beds of ore, coal or building stone, or to ascertainment of the depth of oil, gas or water-bearing strata, has not yet been accorded due recognition by those most interested in the exploitation of such economic materials, with the result that large sums of money have been expended in fruitless search for non-existent treasures.

The rocks of the earth's crust are classified according to their periods of origin into four great groups, each of which represents an era of immense duration, measured in millions of years. These eras are again divided into periods, represented by systems of rock formations, of which 13 are generally recognized, and the periods are again subdivided into epochs, ages, stages and episodes, each of these smaller elements being represented by its corresponding rock-unit. With exception of the Archæan and Algonkian systems at the bottom of the scale, from which no satisfactory fossil remains have yet been obtained, each of the systems has been found to contain an assemblage of fossil organisms quite peculiar to itself, and not found in its entirety in any other system. This assemblage of fossil organisms in any system or in any geological formation constitutes its fossil fauna, which is an imperfect synopsis of the ancient life that formerly inhabited the vicinity of the ocean, lake or land basin in which the particular system or formation originated.

The faunas of two formations of consecutive age have as a rule many species in common, and on the other hand the faunas of two formations representing widely separated periods of time are found to be quite unlike, and to have few species and even few genera in common. The two extremes of such dissimilarity are naturally seen in the Cambrian and Pleistocene faunas at opposite ends of the geologic time-scale.

TABLE OF SYSTEMS, PERIODS AND EPOCHS, WITH DOMINANT TYPES OF LIFE.

Eras	Periods and Systems and Dominant Types	Epochs
Cenosoic Era of Vertebrates 3 million years	Quaternary (Man, Lamellibranchs)	Recent Pleistocene
	Tertiary (Mammals, Gastropoda, Insects, and land plants)	Pliocene Miocene Oligocene Eocene
Mesozoic Era of Reptiles 7 million years	Cretaceous (Pterodactyls, Dinosaurs, Echinoids)	Upper Lower
	Jurassic (Dinosaurs, Crabs, Ammonites)	Upper Middle Lower
	Triassic (Amphibia, Ammonites)	Upper Middle Lower
Paleozoic Era of Invertebrates 18 million years	Permian * (Amphibia)	Upper Lower
	Carboniferous (Land plants, Crinoids)	Pennsylvanian (Coal measures) Mississippian (Subcarboniferous)
	Devonian (Fish, Goniatites, Corals)	Upper Middle Lower
	Silurian (Crinoids, Corals, Eurypterids)	Upper Middle Lower
	Ordovician (Graptolites, Orthoceratites, Trilobites)	Upper Middle Lower
	Cambrian (Trilobites)	Upper Middle Lower
Proterozoic Time 2 years	Algonkian	Life not well known
	Archean	No evidence of life

* Sometimes given as a division of the Carboniferous.

While formations of different ages contain diverse faunas, it is found that a single formation presents essentially the same fauna in all portions of its area of distribution, whence it follows that the fossil contents of a formation are, in general, characteristic of that formation, and that they serve as a means of identifying it in widely separated districts.

These general laws are subject to certain exceptions due to the influence of «facies development,» the variations of faunal expression consequent upon changes in the physical conditions of life. These facial changes, when understood, assist rather than render more difficult the correlation of distant faunas, and their elucidation greatly aids the restoration of the ancient physiographic conditions.

Comparison of the successive fossil faunas with each other and with the modern fauna shows that there has been a slow but continuous progress in the expression of each fauna from that of Cambrian age with its unfamiliar lowly primitive types, to the highly organized animals and plants that form the dominant types of the modern fauna and flora. This progress is manifested in the successive members of the different races of animals that have descended from Cambrian ancestors, by their passing through a particular stage of evolution in each successive period, epoch and stage. Recognition of this stage of evolution enables the palæontologist to correlate entirely new faunas or species with the known faunas of standard sections or scales.

It must not be inferred that all races living at the present day have descended from Cambrian ancestors. Many of our well differentiated forms of modern life can be traced back only to the beginning of the Tertiary, or into the Mesozoic, or perhaps late Palæozoic, where they are represented by species whose distinguishing characteristics are less well developed so that they can scarcely be separated from contemporaneous ancestors of other races. Such early ancestral types which seem to possess in potential state the characters of two or more later descendant races are known as «generalized types.»

There are also numerous groups of fossil organisms that appeared during early days, multiplied, attained their climax, during which they were for a time perhaps the dominant forms of land or sea, and then declined and eventually became totally extinct. Such extinct groups are eminently characteristic of the periods in which they lived.

Facies Development and Faunal Changes. — Facies is the peculiar expression of the physical and faunistic characters of a formation at a particular point, and it is determined by the combination of climatic, physiographic, bathymetric and other conditions reacting upon the organisms of the neighborhood. Some formations, like the Devonian, present several varied facies in a limited area; others, like certain deep-water limestones of Ordovician and Carboniferous age, spread with scarcely any change over vast spaces. The chief types of facies are the littoral, corallic, sub-littoral or pelagic, abyssal, estuarine, fresh-water and terrestrial. The characteristics of each of these, with the organisms peculiar to it, are here passed in review.

A «littoral» facies is represented by deposits formed at the shore and in the shoal water contiguous to it. It comprises conglomerates, sandstones, shales and marls, and its organic contents consist of the remains of animals and plants of beach and shallow water habits. Such are the heavy-shelled mollusks, notably those that feed on marine plants, also abundant worms, heavy-shelled crabs, acorn barnacles and hydroids. This facies is more common than any of the others, for the larger part of the sedimentary rocks have been made up of the products of continental erosion deposited near the coast.

Fossil coral reefs have been recognized in formations of nearly all ages and constitute a «corallic» facies. They are in all cases of shallow water origin, and their presence in ancient rocks has been generally accepted as evidence of the uniformly warm temperature of the seas in which they flourished. In the ancient reefs the coral structure has usually been obliterated by a metamorphic process called diagenesis, and the coral rock has become a dolomite. Such are the Guelph dolomites of the Silurian of New York and Ontario. Fossil coral reefs often afford faunas of many species and abundant individuals. The corallic facies of a formation is always associated, on its landward side, with a sparsely fossiliferous lagoon or saltmarsh phase, represented by red shales, containing gypsum and salt as in the Salina beds of New York, and on the seaward side by a series of highly fossiliferous beds, usually limestones or calcareous shales, which correspond to the deposits of the open ocean. These latter deposits usually abound in fossils of distinct pelagic type, such as cephalopods, brachiopods, sea-urchins, crinoids, crustaceans and thin-shelled mollusks.

«Sub-littoral» or «pelagic» facies comprise the deposits laid down in the deeper water of the continental shelf, and form an intermediate phase between the littoral and abyssal types. The rocks are mostly of organic origin (limestone and lime shales), with fine-grained sandstones and clay shales. As a rule they contain an abundance of well preserved fossils, including the remains of all kinds of animals that inhabit the open sea, together with some members of the littoral fauna. Deposits of this class, with their characteristic faunas, such as graptolite shales, ammonite and pteropod limestones, have often very wide distribution, and are hence of great value for determination of geologic horizons.

«Abyssal» facies is the type characteristic of the greatest depths of the ocean. It is represented in modern time by the foraminiferal and radiolarian oozes, and by green and red muds. It is recognized among ancient rocks by radiolarian cherts of Palæozoic and Jurassic age of Europe and Australia, by the chalk of Cretaceous age of Europe and North America, and by the Pliocene Barbados earth, which latter is evidence of upheaval of great ocean-depths in comparatively recent times.

The three remaining types of facies, «estuarine,» «fresh-water,» and «terrestrial,» are associated with spread of continental conditions. The estuarine or brackish water facies presents lagoon, bayou and estuary deposits of sandstones, conglomerates and clay shales, sometimes alternating with limestones formed during temporary transgression of the ocean. The fossils of such deposits are species of animals that lived in brackish water, mingled with remains of the fresh-water and land fauna and flora that were carried down by river waters and entombed in the estuarine deposits. The nodular shale of Carboniferous age at Mazon Creek, Ill., is a renowned example of this type of facies. Its varied fauna comprises amphibians, fish, clams, river-snails, land-snails, scorpions, spiders, myriopods, insects and crabs, together with abundant ferns.

"Fresh-water" and "lacustrine" facies are deposits formed in fresh-water swamps and lakes, important in the Devonian, Carboniferous, Jurassic and Tertiary systems. The Devonian deposits, known as Old Red Sandstone in Europe and as Catskill standstone in the United States and Canada, consist mostly of red and gray sandstones and shales containing fish and plant remains. The swamp deposits of Carboniferous and later times are represented by beds of coal, lignite and clay shales, all containing abundant plant remains, and rarely relics of the insect, crustacean and vertebrate life. During the Cretaceous, Jurassic and Tertiary Periods, extensive lakes existed upon the several continents, and their sandstone, shales and limestone deposits have afforded hosts of vertebrate and vegetable remains, specially those of the Rocky Mountain region and Europe. Occasional beds of this facies abound in fresh-water snails and insects, as notably at Florissant, Colo. Angular breccias, conglomerates, sandstones, shales and clays comprise the deposits of the terrestrial facies, a type which has not yet been satisfactorily investigated in all its phases. The various deposits originated either as the residuals from denudation, or as flood-plain, desert and prairie deposits. They are important sources of fossils in some cases (flood-plain and prairie phases) but as a rule their mode of origin has not been conducive to preservation of organic remains.

All of these facies are being developed in different parts of the world at the present day; and geologists find that they have been developed more or less completely during all periods of geologic time. It is, however, worthy of note that the various marine facies greatly predominated in the older Palæozoic, that the estuarine and swamp conditions were markedly developed during Carboniferous time in most parts of the world when they were associated with a remarkable increase of swamp vegetation, and that the lacustrine or fresh-water deposits were prominent during the Devonian and again during the Tertiary Periods. Each of the above-mentioned types of facies has its peculiar faunal or floral aggregation of fossils, and study of these features of any formation enables the palæontologist to determine the distribution of the land and water bodies, and even to form some imperfect ideas regarding the nature of the climate, the topography of the land areas and the character and distribution of the fauna and flora of each successive epoch and episode of time.

Palæontology and Evolution.— The researches of palæontologists upon the order of succession of fossil organisms, and upon the various modes of development of certain types from their embryonic to their adult stages, have brought to light many facts supporting the doctrine of evolution, and have also demonstrated the origin and mode of evolution of many races of living and extinct organisms. The results of these investigations along lines of profound interest may be found in the works of Beecher, Bernard, Clarke, Cope, Hyatt, Jackel, Jackson, Koken, Neumayr, Packard, Schuchert, Scott, Smith and Williams whose more important contributions are cited in the bibliography at the close of this article. See EVOLUTION.

Periods of Geologic Time and Their Faunas.— The following sketch of the series of extinct faunas that have succeeded each other as inhabitants of the waters and lands of the earth involves an elementary knowledge of the most important types of animals and plants. (See preceding Table of Systems, etc.) The history actually begins with the close of pre-Cambrian (Algonkian) time when the distribution of land and water was very different from what it is now. Regarding the life of the Archæan we know nothing and of that of the Algonkian very little. Many rocks of the latter system were originally of sedimentary origin, but they have been so thoroughly metamorphosed that few traces of their organic contents remain. The remnants discovered are of types similar to those of the succeeding Cambrian fauna, and include worms, linguloid brachiopoda and crustacean remains. The extensive graphite deposits of the pre-Cambrian rocks are by some authors considered as evidence of original organic deposits.

Cambrian.— The Cambrian system is represented mostly by littoral and shoal-water deposits containing an abundant fauna, which, while of primitive type, is remarkable on account of its high degree of differentiation. Some of the Cambrian rocks, notably the calcareous shales, in regions of slight metamorphism (New Brunswick, Newfoundland and Scandinavia) abound in fossils. Elsewhere the sandstones, conglomerates and limestones are poor collecting grounds. This fauna, estimated to contain 1,000 species, comprises representatives of all the seven sub-kingdoms of invertebrate animals, and of 12 out of 30 classes. Vertebrate remains have not been found in Cambrian rocks. The entire fauna is marine, and the dominant types were trilobites, inarticulate brachiopods and shells usually referred to the pteropods. The trilobites form the most interesting elements of the fauna. Compared with those of later times they are more loosely built, and they present many features indicative of primitive types; characters which are seen only in the embryos of later forms. The brachiopods, of which 120 North American species are known, are almost entirely of the inarticulate type, with thin, rounded or spatulate, phosphatic shells, while there were a few members of the articulate group with transverse, calcareous shells. The hyolithoid shells, with triangular elongate form, are abundant. Sponges are recognized. The corals are doubtfully represented. The echinoderms are represented by a few rare cystoids. Among the gastropods there are coiled shells and limpet-like forms in the middle and upper horizons. The lamellibranchs have a single minute genus, and the cephalopods likewise one minute form. Worm trails and burrows are abundant and various forms of ostracods are found in the finer grained sediments. Radiolarians and foraminifera have been found, some of the latter being indistinguishable from modern species. The only probable plant known is referred to the coralline algæ.

The Cambrian fauna in its entirety shows a very advanced stage in the differential evolution of organic types, and there is good reason to believe that long ancestral lines of fossil organisms originally existed in the pre-Cambrian sediments, and further to anticipate that continued search in the less metamorphosed deposits of that remote age will eventually bring to light some of those much sought for initial types.

Ordovician.— The fauna of the Ordovician, or age of graptolites, shows a marked advance in development of all its types over those of the Cambrian. It also shows a more distinct separation into facies, of which the pelagic, embracing orthoceratite, brachiopod and trilobite limestones and the graptolite shale facies are the more prominent. Most of the groups of animals which were initiated in the Cambrian, enjoyed a rapid evolution in the Ordovician time. During that period the trilobites attained their climax in respect of variety and numbers. The Ordovician trilobites present considerable advance over their Cambrian ancestors in respect of increased compactness of structure, perfection of the eye-structure and elevation of the visual surface above the head, whereby the efficiency of these organs must have been much increased. The cephalopods are represented by numerous orthoceratite genera, with straight or slightly curved shells, some of which were of great size, associated with closely coiled genera that resemble modern nautilus shells.

Among the brachiopods the inarticulate types, so common in the Cambrian fauna, occupy a subordinate place and are represented by numerous species. The articulate order attained so great an expansion that 325 species of North American Ordovician brachiopods are known. The Polyzoa appear first in the lower Ordovician and are abundant and varied in the upper zones. Gastropods are common. Lamellibranchs are common, with several genera of generalized type; corals of various types are common. The hydroid corads formed extensive reefs during Chazy and Trenton time. Echinoderms include abundant cystoids, several crinoids and rare starfishes. The cystoids are especially abundant in the lower Ordovician, where their fragmentary remains form solid limestone beds of several feet thickness. Sponges are common in a few localities and in the Trenton limestone of the Mississippi Valley is found the much discussed Receptaculites. A pelagic facies is recognized in the radiolarian cherts of Great Britain, France and Germany. The graptolite facies of the Ordovician, by some authors considered to be an abyssal facies, occurs in the form of gray and black bituminous shales and slates, in which numerous genera and species of graptolites are found arranged in definite zones that occupy the same relations to each other in widely separated parts of the world. This great dispersion and regular succession of genera and species render the graptolites the most important index fossils for the Ordovician, an advantage which is, however, somewhat negatived by the difficulty attending their study. The group began in the upper Cambrian, attained wide distribution and various evolution during the Ordovician and declined during the Silurian. These graptolite beds are well demarcated from the molluscan and brachiopod limestones and while they occur between the latter at various horizons throughout the general Ordovician and Silurian formation scales of Europe and America, they are best developed in basins where little of the other facies seem to have existed. The faunas of latest Ordovician time are known in only a few regions, since that period was one of comparatively sudden uplift of continental masses, accompanied in many parts of the earth by formation of mountains. But the few late remnant faunas that found shelter in protected basins present a transitional phase between the normal Ordovician and the succeeding Silurian faunas. Late Ordovician time is represented in most parts of North America by a marked hiatus of unconformity indicating wide land areas.

Silurian.— The earliest Silurian fauna of North America, that of the Clinton group, contains a few relics of the Ordovician fauna lingering on among a host of new species and genera, which were introduced with the return of marine conditions over the interior sea basin. The American rocks and faunas of Silurian time indicate: first, muddy waters of the Clinton epoch; followed by clear seas of Niagara time inhabited by a luxurious fauna, and in which pure organic limestones were deposited. Subsequently the shallow mediterranean Guelph Sea of America became dotted with extensive coral reefs, and toward the end of Silurian days the epicontinental seas were again largely drained to form lagoons, tidal mud-flats and salt lakes of Salina time. Then ensued a short period of wide land-emergence before the early Devonian transgression began. Facies development is well marked and it is worthy of note that the various facies occur in the same relative order and at equivalent horizons in widely separate regions; evidence that the causes which influenced their development in Silurian time acted simultaneously during successive epochs over the entire northern hemisphere. The mollusk-trilobite limestone of Niagara age in North America is duplicated by that of similar age in England (Wenlock), Sweden (Gotland) and central Europe (Bohemian). The Eurypterus fauna of the Salina group of New York is duplicated by the contemporaneous water-limestones of the English Ludlow and the Baltic Rotziküll beds. The corallic facies of the American Guelph is of the same age and character as that of the English Dudley, Swedish Gotland and Bohemian dolomites; and finally the Monograptus shales of Great Britain, Bohemia, Brittany, Scandinavia and New York are all of lowest Silurian age. Another interesting feature of the Silurian fauna is its division into two well-marked types — a northern or Baltic-British-American type and a southern Bohemian-Mediterranean phase, the species of which are quite distinct. All of the Silurian faunas of North and South America and of Asia are of the northern phase, and the Bohemian-Mediterranean type appears to be merely a local facies. It is of interest that the Silurian fauna of Australia contains representatives of both types.

The chief characteristic of the Silurian fauna is the great evolution of the crinoids, corals, the spire-bearing brachiopods and the

Eurypteridæ. Protozoa are rare; sponges and corals attain a remarkable variety and abundance, and in many districts the latter formed extensive reefs. The graptolites begin to decline. Cystoids take second rank after the crinoids, whose sudden expansion is expressed in the ratio of about 450 Silurian species to less than 50 from the Ordovician. The brachiopod fauna, while no larger, differs from that of the Ordovician in the increase of the spire-bearing types and in the remarkable development of inarticulate types with large solid shells. Lamellibranchs offer no important changes. Gastropods are numerous. Tentaculites, usually referred to the pteropods, occur by myriads associated with ostracods. The Silurian Cephalopods comprise straight-shelled Orthaceras, curved and turreted forms and coiled Nautilus.

The Arthropoda are represented by rare barnacles, numerous ostracods, some phyllocarida, rare scorpions, spiders and insects as well as by the trilobites and eruypterids. The trilobites show a slight decrease in numbers, but a greater diversity of form over their Ordovician ancestors. The water limestones (of mud-flat origin) of the Salina of New York and equivalent European deposits afford abundant remains of Eurypterids (q.v.), some of which grew to be six feet long. These creatures resemble in habits and structure the modern horseshoe crab (Limulus). Rare scorpions, spiders and insect remains have also been found in these uppermost Silurian lagoon deposits, and they show no very great differences from similar types of the Carboniferous. Their presence indicates the existence of terrestrial life on the extensive continental areas that emerged toward the end of Silurian time. In these highest Silurian rocks, specially in the Ludlow beds of England, Scotland and Podolia, are found the earliest remains of vertebrate animals in the shape of primitive fish-like creatures of the order Ostracodermi (q.v.).

Devonian.— The Devonian Period was one of constant local physiographic changes, and accordingly its formations and faunas present a greater variety of facies than is seen in any of the older Paleozoic systems. There are two prominent types of the Devonian, each with its distinctive fauna: (1) The marine deposits of limestones, marls, shales and sandstones; (2) the continental or terrestrial phase, known as the Old Red sandstone in Europe and as the Catskill shales and sandstones in the eastern United States and Canada. This twofold aspect of the deposits is more or less prominent in all the geological systems above the Devonian. The Devonian fauna as a whole is distinguished by the development of land vegetation, by rapid evolution of fishes, lamellibranchs and of goniatite cephalopods, and by the decline of trilobites and practical extinction of the graptolites and cystoids. Other groups expanded. Sponges comparable with the modern Venus-flower-basket, flourished in shallow seas; corals are abundant and formed reefs in many regions. The Hydrozoa are represented by numerous reef-building stromatoporas, and by straggling survivors of the graptolites. Among echinoderms the cystoids are rare; starfish and ophiurians occur commonly at a few localities, and the crinoids are the dominant types of this class, though not so abundant as in the Silurian. The blastoids are represented. Worm-trails are common in the shales and sandstones of the middle and upper Devonian. A host of new brachiopods appears, while many Silurian genera run on. Lamellibranchs show a great advance over those of the Silurian, and in certain shale and sandstone formations they outnumber all other types of organisms. Gastropods of the family Capulidæ are abundant, and minute pteropod shells often form solid limestone beds. Among cephalopods a new type of closely coiled shells, Goniatites, with slashed sutures, appears in the lower Devonian, evolves rapidly and reaches its climax before the close of the period. An extinct group of crustaceans, the Phyllocarida, with long strong caudal spines, reach a considerable development, especially in the Hamilton epoch. Eurypterids are rare, though represented by the gigantic Stvlonurus in the Catskill beds. The trilobites have many large and bizarre members, as well as a number of small, degenerate forms, during the early and middle Devonian, when they manifested a strong tendency to develop spines along the margin and on the surface of the carapace.

The Devonian is aptly termed the "age of fishes," for within its limits this class enjoyed a great expansion. The lowest Devonian fish fauna is like that of the upper Silurian with numerous Ostracoderms. This is succeeded by a fauna with a large number of acanthodian sharks, which are indicated by their spines. No remains of any vertebrates higher than fishes are known in the Devonian.

Plant remains in the form of marine algæ are found throughout the Devonian. Some of these, like Nematophyton of gigantic size, were long supposed to be the trunks of coniferous trees. Others with delicately branching fucoid leaves are common, especially in the Hamilton, Portage and Chemung groups. The continental phase of the Devonian has afforded the earliest examples of land vegetation, all prophetic of the succeeding Carboniferous types. Both the fauna and flora of the upper Devonian show marked affinities by gradual transitions to those of the Subcarboniferous. See PALEOBOTANY.

Carboniferous.— The early part of the Carboniferous period was marked by a continued recession of the sea, which had begun in late Devonian time, and during the Carboniferous the land areas seem to have reached a greater expansion than they have at the present day. These Carboniferous land masses were of very different forms and situation from the present day continents. An Arctic continent occupied the greater part of the Arctic zone and extended by broad peninsulas southward toward the equator, over what are now eastern America, eastern Asia, central Europe and the eastern Atlantic Ocean. Another, Indo-African continent, covered that part of South America east of the Andes, extended across the south Atlantic, Africa, the Indian Ocean and Australia. An ocean spread over the present Pacific basin and also over Alaska, all of the United States west of the Mississippi River, Central America and the western part of South America, while a great mediterranean sea of irregular form encircled the globe and communicated at both ends with the Pacific Ocean. There was also a small Antarctic sea. Toward the close of Carboniferous time the ocean again transgressed and the land masses became for a time somewhat reduced in size. The Carboniferous formations consequently present two well-marked facies: a marine facies with deposits of limestones and shales with mollusks, brachiopods, corals and foraminifera, more widely spread on the lower and upper Carboniferous; and a continental phase of sandstones, shales and coal-beds, holding abundant plants, and in some localities numerous insects, fish and amphibians. These facies as a rule occupy different basins, but occasionally they are found dovetailed into each other in such manner that their relative ages can easily be determined. The lands of Carboniferous time and especially the coastal swamps supported a dense and rank vegetation comprising more than 1,500 species of plants. Ferns, some of great size, were the most common type. Calamites with fluted many-branched stems and variform foliage, were giant predecessors of our modern horse-tail rushes (Equisetum). Lepidodendron and Sigillaria, related to clubmosses (Lycopodium), with trunks often five feet thick and 75 feet high; Cordaites with sword-shaped yucca-like leaves on a solid trunk 25 to 30 feet high; and other great tree-like plants intermediate in nature between the ferns and cycads, formed the bulk of the forest growth. In the shelter of these forests lived numerous insects, mostly primitive cockroaches, also dragon-flies, one of which had wings over 20 inches across; primitive forms of locusts, crickets, grasshoppers and also scorpions that were much like those of modern type. On the shores of the swamps lived large amphibious myriopods whose bodies were armed with branching spines. Some land snails like modern Pupa and Zonites have been found. The fresh-water facies also contain remains of lizard-like amphibians (Stegocephalia), many of which have been found in hollow Sigillarian stumps.

The marine phase of the Subcarboniferous contains the first abundant foraminiferan deposits. Minute Endothyra shells form the bulk of the Indiana oolitic limestone; Fusulina, like grains of wheat, and Schwagerina, a globular form, build great limestones in the upper Carboniferous. Corals are not so abundant as in the Devonian and coral reefs are rare. Crinoids were locally very abundant, especially in the Subcarboniferous beds at Burlington, Keokuk and Crawfordsville in the Mississippi Valley, where about 650 species have been found. The blastoids, with Pentremites as their most abundant type, attained their climax in the Subcarboniferous of America. Among the abundant bryozoa, one genus Archimedes, with its screw-like axis, is a good index fossil of the Subcarboniferous. Brachiopods were abundant as were also the Lemellibranchs. Gastropods present a number of heavy-shelled forms; among the Cephalopods, the orthoceratites have greatly declined; nautiloids abound, and the goniatites show great advancement over those of the Devonian, and toward the end of the period transitional types suggestive of the Triassic ammonites appeared.

The arthropod fauna of the Carboniferous is poor in trilobites, but eurypterids are common in some coal measure shales.

The Carboniferous vertebrate fauna is of interest by reason of the sudden expansion of amphibian types in the upper part of the system. The Stegocephalia (labyrinthodonts) are represented by several genera, and consist of generalized types suggestive of the later crocodiles, lizards and snakes. The fish-fauna is abundant, comprising sharks and ganoids. The Waverly shales of Ohio have afforded numerous large lungfishes, and some fine examples of acanthodian sharks. Over 600 species of fish have been described from the Subcarboniferous limestones of America.

Permian.— During Permian time the continental conditions were even more prevalent than during the Carboniferous, and accordingly the marine phase is much restricted in distribution and its fauna diminished in numbers. Both plants and animals are transitional between those of the Carbóniferous and Triassic. Many types characteristic of the Palæozoic have their last representatives, some of them, it is true, occurring abundantly, in the rocks of this system. Productus, Orthoceras, goniatites, trilobites and the fenestellid bryozoa, which latter formed extensive reefs in Europe, all become extinct with the close of the Permain. Other types, some of them initiated during the Carboniferous or earlier and continued into the Trias attain a considerable expansion, and give to the fauna a decided Mesozoic aspect. These are found among the lamellibranchs as well as among the ammonoids, fish and amphibians. The ammonoids attained a great expansion. The fish fauna of the Permian consists mainly of ganoids. Acanthodian sharks reached the climax of their evolution. The stegocephalian amphibians were varied and common, and were the dominant types of life. There were also snake-like members of this group, one of which was nearly 45 feet long. A new type of vertebrate appears in reptiles of land and fresh-water habits.

While the Permian flora is in general the same as that of the Carboniferous it contains some types not seen in the latter.

Mesozoic.— The Mesozoic fauna and flora are distinguished from those of the Palæozoic by the absence of trilobites, graptolites, orthoceratites, long-hinged brachiopods, tetracorallic and tabutate corals, cystoids, palæocrinoids, blastoids, eurypterids, goniatites, acanthodian sharks, and the great lycopods. On the other hand this era is marked by the introduction of numerous new types and by the expansion of many invertebrate groups, land and marine reptiles, multituberculate mammals, cycads and conifers. During the era a great change in the expression of the life is apparent, in that the early Triassic life presents close analogies with that of the late Permian, while during the era an almost complete change takes place, and that of the upper Mesozoic, especially the vegetation, affords considerable resemblance to the early Tertiary.

Triassic.— The wide extension of continental areas continued from Permian into Triassic time with perhaps a slight increase, and in North America marine Triassic fossils have been found in only a few places in the far West. The fauna as a whole is an impoverished one. The continental Trias, consisting of red beds in America, Europe and Asia, contains abundant remains of ganoid fish together with some cycads and conifers. In some regions these beds have afforded also numerous remains of often gigantic stegocephalian Amphibia, which attained their climax during this period. Small amphibious precursors of the large marine Jurassic ichthyosaurs and plesiosaurs are found. The Theromorpha, reptiles exhibiting remarkable affinities with the carnivorous mammals, attained a great development in South Africa. The first turtles, crocodiles and dinosaurs occur here. The earliest mammalian remains consist of fragmentary jaws and multi-tuberculate teeth of small animals supposed to be allied to the modern monotremes.

The marine Trias is found well developed in the Alps with extensions into Asia Minor, India, Arctic regions, Pacific States and Australia. The number of species is comparatively small, though individuals are abundant. Foraminifera and calcareous sponges abound. Corals of perforate and aporose genera formed extensive reefs in some regions. Crinoids are represented. Sea-urchins were present. Among the brachiopods are a few remnants of Palæozoic genera, while new families are surprisingly developed. The lamellibranchs begin to show considerable expansion and the first true fresh-water unios appear here. The marine gastropod fauna is abundant, with some old types and others of later Cretaceous and Tertiary aspect. The ammonites, which began in the Permian, show a wide differentiation of form and complexity, and attain the culmination of their evolution in the upper Trias. Over 1,000 species have been described. Ostracods are abundant.

Jurassic.— The facies development of this system is very varied; the continental phase predominates in America as the Newark or Connecticut River sandstones, while the marine phase is most prominent in Europe and Asia. The Jurassic flora is quite similar to that of the Trias, made up of cycads and conifers which are forerunners of the recent pines. Among marine invertebrates the sponges and corals, largely of modern type, were so abundant as to form great reefs. Crinods were abundant in individuals, though genera and species were few; echinoderms and Bryozoa were common, while the brachiopods were restricted to a few families. The lamellibranchs and gastropods include the first representatives of a number of modern families. The ammonites are by far the most abundant and characteristic forms of mollusks, and by means of them the marine Jurassic of Europe has been subdivided into some 15 zones, each characterized by its particular species. Belemnites, the solid cigar-shaped internal shell of squid-like cephalopods, are very abundant and varied, and the fossilized ink-bags of these creatures are common in some formations. The crustacean fauna shows a great increase of long-tailed decapods allied to prawns, shrimps and crayfish, and the earliest true crabs. Insects include dragon-flies, May-flies, termites, grasshoppers, crickets, walking-sticks and some beetles; also occasional bugs, flies and ants. The ganoids with heterocercal tails take a subordinate rôle while those with homocercal tails and scaly rhombic plates predominate. Sharks and rays and the first teleost, or modern bony fishes complete the Jurassic fish fauna.

The reptiles form the most interesting group of the Jurassic fauna, for during this period they reached the highest stage of their evolution both in variety and abundance. The Triassic stegocephalians and Theromorpha give place to the terrestrial dinosaurs and the marine ichthyosaurs and plesiosaurs. The latter held somewhat the same relation to reptiles that the whales of modern time hold to the mammals. Those sea lizards swarmed in the Jurassic seas where they preyed upon the fish. The dinosaurs held sway upon the land, not only during the Jurassic period, but also during the greater part of the succeeding Cretaceous. Another type of reptile prominent during Jurassic time and continued into the Cretaceous was the group Pterosauria or flying lizards, of which the pterodactyl is the best known example. Other types of reptiles, as turtles and crocodiles, are more or less common. At the same time when the reptilian stock developed flying creatures there appeared the earliest known bird. (See ARCHÆOPTERYX). The mammalian remains of Jurassic time are known only by isolated teeth and jaws of small size and very rare, and all are related to the marsupials and monotremes.

Cretaceous.— The flora of the lower Cretaceous is like that of the Jurassic, but gradually the cycads diminish in importance and a host of angiosperms appear, very similar to the trees and shrubs of to-day. Many genera of recent tropical and temperate zone plants occur in the Cretaceous rocks of Greenland and northern Europe, facts cited as evidence of the mild climate of those parts during Cretaceous time. The ammonites begin to decline and we see numerous degenerate types, last members of various races, with shells loosely coiled, turreted, hook-like, or even straight, many of which are characteristic index fossils. The group becomes entirely extinct with the close of the Cretaceous.

The close of Cretaceous time terminated the middle or Mesozoic period of the history of organic life and marked the extinction of a number of types of animals which had for long epochs dominated the lands and seas. This extinction is perhaps more evident here than at the end of the Palæozoic, and its causes are wholly unknown. It is true that some groups (Ammonites) had already begun to show marked degenerate tendencies attendant upon race senility, but the majority of the groups became extinct at the height of their evolution, when they were represented by their most highly specialized types. It is possible that this very specialization rendered them more liable to injury by slight though abrupt climatic changes or by sudden variations in the depth of the seas in which they lived. The great land and marine reptiles, the flying lizards, the mososaurs and toothed birds all became extinct. Likewise the ammonites and belemnites, so characteristic of the Mesozoic, have not been found above the upper limits of that system.

Cenozoic.— The life of this era is like that of recent time, particularly the marine life, for the terrestrial mammalian life of a large part of the system is very dissimilar to modern animals. The early classification of this system was based upon the increasing percentage of still living species found of both plants and animals fossil in the deposits. (See PALÆOBOTANY). Some of the distinctive types of invertebrates were of larger size than usual. Sponges and corals are abundant only in restricted localities. Foraminifera, Radiolaria, echinoderms, Bryozoa, lamellibranchs and gastropods are present in great variety while crinoids, brachiopods and cephalopods are comparative rarities. The preponderance of crabs, with a number of extinct genera, over the long-tailed, lobster-like decapods is very marked. Acorn barnacles, often of large size, are common, and fresh-water snails and mussels, all of modern types, are abundant in the fresh-water deposits of both Europe and America. Insects of all kinds have been found in the Oligocene and Miocene deposits, especially at Florissant and White River, Colo., and in the amber of the Baltic provinces, which latter has furnished about 2,000 species.

But the greatest interest attaches to the vertebrate fauna of the Tertiary, for during the early days of this period the placental mammals outstripped the marsupials and monotremes and became the lords of the land, and toward the end of the period appeared man. The reptiles, which held so prominent a place during the Mesozoic, are reduced to the true lizards, snakes, crocodiles and turtles. The amphibia which, as Stegocephalia, had become almost extinct during the middle Mesozoic were resurrected in the Eocene as salamanders, toads and frogs, and continued thence till the present day. The fishes included numerous large sharks and a preponderance of bony fishes, of which many belonged to modern genera, such as perch, herring, carp, pike, catfish, eels breams and mackerel. Birds exhibit a continuously expanding evolution during the Tertiary and they are still expanding. See MAMMALS; TERTIARY PERIOD.

Conclusion.— The dominant types of the consecutive periods present on the whole an increasing degree of perfection of structure, and the dominant types of one age are, as a rule, not related to the dominant types of the preceding age. These dominants are usually the most highly specialized members of the classes or orders to which they belong, and it is further to be noted that dominance and high specialization have in most cases been soon followed by decline and extinction. The small primitive forms of one period may evolve into the large dominant types of the next epoch and in their turn decline and disappear. In the invertebrates and lower vertebrates (fish, amphibia and reptiles) the rate of this evolution, and consequently the destiny of the race, is almost wholly dependent upon the presence and continuance of favorable conditions of existence, for these types have little or no ability to surmount physical difficulties. Among the higher vertebrates, enlargement of the brain mass and of the mental faculties enables the animals to circumvent unfavorable conditions to some extent, but they also are comparatively helpless. It is in man, with his highly-developed intellect and mechanical skill, that we see the only organism able not only to circumvent unfavorable conditions of life but actually to nullify them and to practically subjugate all other organisms or render them useful to him in his affairs. We have said that high specialization indicates approaching decline and extinction. That is true in respect of structural evolution, but as regards intellectual evolution, and the directions in which it may differentiate, we know next to nothing beyond the fact that intellectuality has up to the present time evolved with remarkable acceleration. In view of this it seems impossible to conceive otherwise than that man, under strong physical, moral and religious control, can have before him any other than a future longer and more brilliant than his comparatively brief existence.

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PALEOZOIC ERA, the second great division of geologic time and the first one in the sediments of which well-preserved organic remains have so far been found in abundance. It is preceded by the Proterozoic division and succeeded by the Mesozoic (mediæval life) and the Cenozoic (recent life) time divisions in ascending order. The name signifies ancient life and has reference to the character of the plant and animal life of the time, which was markedly unlike that of the present. As a time division, the Paleozoic is generally called an era, this term meeting with the recommendation of the International Geological Congress at its Bologna Convention in 1881. Dana in his ‹Manual of Geology› (5th ed.), however, used the expression «Paleozoic Aeon or Paleozoic Time,» and applies era to the next smaller subdivision. In this he has been followed by several authors. Though in its modern sense primarily used for a time division, the term Paleozoic is also applied to that division of the earth's crust which was formed during that time. And indeed this is the original use of the term, when it was coined for the reception of the fossiliferous rocks below the so-called Secondary or Mesozoic formations. The rocks thus named were formerly included with the crystalline rocks of all ages as «Primary,» but later on they were separated at least in part, as «Transition rocks.» Lyell, to avoid confusion, spoke of them as the «Primary fossiliferous rocks.» The following parallel columns express perhaps as nearly as possible the correlation between the older and newer terms:

Older	Newer
Quaternary Tertiary }	Cenozoic or Cainozoic
Secondary	Mesozoic
Transition (or primary fossiliferous.	Paleozoic
Primary	Proterozoic

In the formation scale the term «group» was recommended by the International Congress as of co-ordinate in rank with that of era in the time scale. This recommendation has not been very generally adopted in America, where the term group is commonly used for a smaller formation. «Series» is sometimes used for such rock divisions as that corresponding to the Paleozoic Era but more commonly corresponds with epoch in rank.

The following subdivisions of the Paleozoic are recognized:

Carboniferous period and system.	Permian Epoch and series Pennsylvanian Epoch and series Mississippian Epoch and series
Devonian period and system	
Silurian period and system	
Ordovician period and system	
Cambrian period and system	

Characteristic Life of the Paleozoic.— The characteristics of Paleozoic life were very marked and stamp the Era as boldly contrasted with the succeeding Mesozoic. The Hydrozoa were represented by the group of Graptolites, wholly confined to the Paleozoic. Among corals the Tetracorolla (so-called from having four primary radiating lamellæ or septa with reference to which the others are arranged), the honey-comb corals, the tube corals, and the chain corals are characteristic types practically unknown in post-Paleozoic time. Among the Echinoderms, the two groups of Cystids and Blastids are wholly confined to the Paleozoic, while the Crinoids, or sea lilies, with few exceptions are likewise restricted to the Paleozoic. Star-fish, brittle stars and sea-urchins, while represented in Paleozoic rocks are more characteristically known from later strata. The Bryozoa, or sea moss, are well represented. These often constructed extensive reefs and in the Ordovician especially, gave rise to extensive deposits.

Brachiopods are perhaps the most important Paleozoic types, no less than 2,600 species having been described from the Ordovician and Silurian deposits alone. Several archaic families range from the Ordovician to the present time while modern types such as some of the Terebratuloid families begin in the middle or late Paleozoic. By far the largest number, however, end with the Carboniferous or before, while a few others run on past the close of the era.

Turning to the Pelecypods or bivalve mollusks, we find that their principal representatives belong to post-Paleozoic time. A primitive order represented by such modern types as the oyster and scallop (Pecten), alone has a prominent representation in the Paleozoic, where about 30 families are found. Of these more than one-half continued to exist beyond Paleozoic time, with few exceptions indeed down to the present time. Only 13 out of 40 families of this order (as now understood) are confined to the Paleozoic. On the other hand post-Paleozoic time is characterized by about 86 families. The gastropods are likewise essentially post-Paleozoic Mollusca, those of Paleozoic time being essentially primitive or archaic in character.

The cephalopods were well represented during the Paleozoic by the Nautiloidea. Of 40 families belonging to this class only three originated in post-Paleozoic time and only one of these, the family of the true Nautilus, continued to the present time. Of the 37 Paleozoic families three or four ran on past the end of the era. The straight-coned nautiloids, the bent cones and the loose-coiled cones are practically confined to the Paleozoic rocks, the close-coiled forms alone characterizing later horizons as well. The ammonoids on the other hand are represented in Paleozoic rocks only by their more primitive types.

Among crustacea, the Trilobites are wholly confined to the Paleozoic rocks, of which they constitute in many respects the most characteristic type of fossil. Their greatest development was during Cambrian and Ordovician time. The remarkable order of Eurypterid crustaceans is also confined to the Paleozoic, constituting the most characteristic type of certain formations. The only other type of crustaceans abundantly represented in the Paleozoic rocks is that of the small bivalve ostracods.

Paleophysiography of North America.— The physiographic changes which the North American continent suffered during Paleozoic time may be summarized as follows: In early Cambrian time the greater part of the interior of North America was out of water, the eastern shore being probably a short distance east of the present Appalachians, and the western shore on the western flanks of the Rocky Mountains. The southern shore was not far north of the present southern boundary of the United States. A narrow gulf extended northward along the Appalachians and probably connected with a similar gulf extending southward from the present Saint Lawrence Gulf. The land mass to the east of this trough has been called Old Appalachia and remained persistent throughout most of Paleozoic time. There is some reason to believe that a persistent trough also occupied the site of the Great Basin and that another persistent land mass lay to the west of that. The great interior, between these troughs, was land in early Cambrian, but gradually sank with many minor fluctuations, to a maximum submergence in mid-Ordovician. It was again widely emerged at the close of the Ordovician when the Taconic Revolution raised mountains in New England. A gradual resubmergence in Silurian times, re-established the sea. In mid-Silurian it extended northwestward over what is now Hudson Bay and the Arctic regions beyond. Near the close of the period, the sea became much restricted or wholly enclosed and highly saline. In this North American dead sea, the great Silurian salt and gypsum beds of New York, Ohio and Michigan were deposited. At the close of the Silurian nearly the whole of the North American continent became dry land and the sea was reduced to a narrow channel along its former eastern border. Toward mid-Devonian time this sea spread westward again to Michigan and southward to Indiana and the great Paleozoic coral reefs began to flourish. Many fluctuations and adjustments took place, the eastern border of the sea growing shallower and the western deeper. In early Carboniferous time, the sands deposited in the eastern part of this mediterranean sea permitted the existence of only a sparse fauna, while in the region now known as the Mississippi Valley, great reefs of crinoids flourished. In mid-Carboniferous time, the interior sea extended to the foot of the Rocky Mountains, while the greater part of the region east of the present Mississippi River was converted into the fresh water morasses, in which the extensive coal beds of eastern North America were deposited. This condition continued with slight changes through late Carboniferous (Permian) time. At the same time western United States was the site of extensive enclosed seas, which under an arid climate gradually decreased in size, with the deposition of great beds of salt and gypsum. While this aridity existed in western United States and also in Germany, India, South Africa and Australia were colder than now and undergoing severe glaciation. The era was terminated by the great physiographic changes which accompanied the formation of the Appalachian Mountains and which has been called the Appalachian Revolution. This resulted in the permanent elevation of much of the North American continent. Marine deposits of the early Mesozoic are known only in the northwest, west and southwest. Later in Cretaceous time, the Great Plains region and the Atlantic border were resubmerged, but eastern North American remained continuously above water, with the exception of a slight submergence in the Hudson and Champlain valleys in late Pleistocene time.

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PALERMO, pä-lĕr'mō, Italy (1) a seaport town, capital of Sicily, beautifully situated on the northern shore of the island on the Gulf of Palermo, surrounded by a fertile plain and partly enclosed by lofty hills. Its numerous spires, domes and towers give it a very imposing appearance when approached from the sea. Two main streets, the Via Vittorio Emmanuele and Via Macqueda, intersect the city at right angles to each other. Near the centre is an octagonal space, the Quattro Canti, lined with elegant buildings in different styles of Grecian architecture and adorned with numerous statues. The two principal streets are opened into by a great number of others, mostly narrower and of an inferior description; but all well paved with blocks of lava. There is now an extensive system of electric tramways. Admirable places of resort are provided by the Marina and the Flora — the former a superb terrace about 80 yards wide, stretching about a mile along the bay; the latter, commencing in the east where the terrace terminates in a magnificent public garden regularly and beautifully laid out, and adorned with statues, fountains and rustic temples. Here is also a botanic garden of some extent, and there are several other public gardens. The public edifices are numerous, but do not in general display much taste. The most important are the cathedral, the church of San Giuseppe, the church of San Salvatore, La Martorana, and other churches; the royal palace, finely situated and surrounded by beautiful gardens, a large and irregular pile of buildings, among which the only great attractions are the chapel of King Roger (or Palatine Chapel), rich in mosaics, «perhaps the most beautiful palace-chapel in the world,» and the observatory; the archiepiscopal palace; the national museum and picture-gallery; the communal library, with about 220,000 volumes; the national library, with over 150,000 volumes; the university, attended by 1,200 students; the barracks, arsenal, courts of justice, theatres, hospitals and several literary and charitable endowments. Palermo has a good roadstead and harbor, which has been recently improved, and a well-equipped shipbuilding yard and dry dock have been constructed. The principal articles of export are sumach, wines, oranges and lemons, sulphur, tartar, olive-oil, citrate of lime, tomatoes, tomato paste, asphalt, hides, dried vegetables, macaroni, etc.; and among the imports are coal, grain, wood, petroleum, tobacco, iron and steel rails, sheets, bars, etc., cement, machinery, sulphates, fish, etc. The total number of vessels that cleared from the port in 1900 was 3,732, with a tonnage of 1,677,234. The manufactures of the town include gloves, marble works, etc., and there is a foundry. The fisheries on the coast are productive, and give employment to numerous hands. Palermo is the see of an archbishop, and the seat of a supreme court with jurisdiction over the whole island; of a criminal court for the province; of a commercial and several other inferior courts, and of several important public offices. Its foundation is attributed to the Phœnicians. From them it passed to the Carthaginians, who made it the capital of their Sicilian possessions and the centre of an external commerce. The Romans obtained possession of it in 254 B.C., made it a free town, and conferred upon it many important privileges, in consequence of which it increased rapidly and became very prosperous. After the fall of the Roman empire it remained, except for a brief vandal rule, a part of the Eastern empire, till in 835 the Saracens became its masters, and kept possession of it till 1071, when it was taken by Roger the Norman, who founded the kingdom of Sicily. Since then it has always continued to be the capital. It has repeatedly suffered from earthquakes. This and the other vicissitudes which it has undergone is probably the reason why so few remains to antiquity are to be found within it. Some, however, still exist in its environs, which, both on this account and their own intrinsic beauty, are in many respects more attractive than the town. During an insurrection which took place in January 1848, the town was bombarded; and Garibaldi seized it in 1860. Pop. about 325,000. (2) The province has an area of 1,948 square miles. Its coast consists of a series of extensive bays and bold promontories. Its interior toward the south is traversed, east to west, by a branch of the Neptunian Mountains. The streams are numerous, but small. The soil is fertile. Pop. about 300,000.

PALES, pā'lēz, in ancient Italy, a divinity who presided over fields and meadows, and was worshipped sometimes as a god, sometimes as a goddess, in which latter character Pales was identified with Vesta or Anna Perenna. The festival of Parilia or Palilia was celebrated 21 April, the anniversary of the founding of Rome, when milk and cakes of millet were offered. Shepherds begged forgiveness for any trespass their flocks might have made on sacred places, and prayers were made for the prosperity of the flocks. Cognate with Pales are «palatium,» a palace, and «Palatinus,» one of the seven hills of Rome, and this divinity, as protector of property and home, is among the earliest figures that occur in Roman mythology.

PALESTINE, also called **THE HOLY LAND, CANAAN, JUDEA,** and **THE LAND OF ISRAEL,** a classic region southwest of Syria. Its western shore forms the eastward boundary of the Mediterranean Sea and its north, east and south boundaries, respectively, are the Mountains of Lebanon, the Arabian Desert and Arabia Petræa. It is situated between lat. 31° 30′ and 33° 30′ N.; long. 34° 30′ to 36° E.; has a length north to south of about 110 miles, a breadth of 50 to 60 miles, and an area of about 10,000 square miles.

Topography and Physical Features.—The surface generally is mountainous, traversed by branches from the chain of Lebanon, one of which stretches south in a direction nearly parallel to the coast of the Mediterranean, forming the watershed between its basin and that of the Dead Sea; while another, turning more to the east, stretches along the left side of the valley of the Jordan. The mountains attain their greatest height, of about 9,100 feet, in Mount Hermon, where they first become detached from the principal chain. None of the other heights exceed 4,000 feet; but many are celebrated from the frequent mention made of them in the Bible, and from the events of which they have been the theatre. The most remarkable are Carmel, forming a promontory in the Mediterranean, on the southwest side of the Bay of Acre; Tabor, or the modern Jebel Tur, at the northeast extremity of the plain of Esdraelon; Ebal and Gerizim, in the valley of Samaria; Gilead and Nebo, or Pisgah, on the east side of the Jordan; and Zion, Moriah, and the Mount of Olives, in and near Jerusalem.

Of limestone formation, the mountains abound in caves of all varieties of size and form, many of them of Scriptural importance. The earliest mention of a cave in Scripture is in the history of Lot (Gen. xix, 30). The next is at the death of Sarah, when Abraham bought the cave Machpelah for a burying-place. This is now contained within the limits of a mosque, at Hebron, and remains in all probability just as it was when the patriarchs were buried in it. The Moslems can give no real information regarding it, for they will not enter it, dreading immediate death at the hand of Abraham's spirit, which they believe to reside in it. Caves are frequently mentioned in the books of Judges, Joshua and Samuel, but the only one specified is that of Adullam, which has been identified with the care of Khureitûn (the ancient Hareth), some five miles south of Bethlehem — a singular cave, or rather series of caves and chambers, extending for miles, to which the one entrance is an orifice not larger than a door, half-way down the almost perpendicular face of a precipice; this orifice is reached by a shelf or ledge of rock, along which one has to find the way cautiously to the cave. The interior is quite a labyrinth, with vaulted chambers remarkably dry and warm, but with no impure air. It could accommodate hundreds of men, all hidden in these far-extending chambers. There are caves at Deir-Dubban, not far from Khureitûn, about half-way between Jerusalem and Eleutheropolis, but these do not correspond with the scenes in David's history; although these western ones are reputed to be David's cave, and the eastern (Khureitûn), near Tekoah, Saul's caves or cave. That these huge caves or grottoes at Deir-Dubban were used both for hiding-places and dwelling-places, both in Jewish and Christian days, is quite evident; but whether this is the place of the Adullam cave of David is not so plain. There were caves in Galilee also. The «cotton cave,» or «Kotton-Megharah,» under Jerusalem, is a wonderful cavity, extending under a large portion of the city. But though called a «Megharah,» it is an old quarry, out of which Jerusalem was partly built, and therefore interesting, especially as the traces of the quarrymen are still visible in every recess.

Palestine has comparatively few plains, but has numerous valleys; it is the country which Moses describes, «a land of hills and valleys.» The small plains are numerous, the large few; among them are the maritime plains of Phœnicia and Philitia, the river plain of Jordan, the inland plain of Esdraelon, and the mountain plain of the Bekâ, between the two Lebanons. These are widely different from each other, though within a small territory. The sea plain from Gaza to Beirût are well peopled and tilled. The Jordan plain is nearly a waste of sand, that river making no further impression upon the levels on each side than merely to fringe itself for some 20 yards with verdure. The Esdraelon plain, or «valley of Jezreel,» is a fine plain of considerable extent, fertile and well cultivated. In the district of El Huleh or «the Waters of Merom,» and in such low-lying districts as Merj-Sanur, between Samaria and Jenin, are marshes and at certain seasons wide tracts rendered almost impassable by the overflow of streams. The heat during the greater part of the year, from April to November, dries up most of the marshes and scorches both hill and plain. In later ages this is more especially true, as formerly the extensive woods, orchards, vineyards and olive-yards which clothed the country shut out the heat, cooled the soil, and retained the moisture.

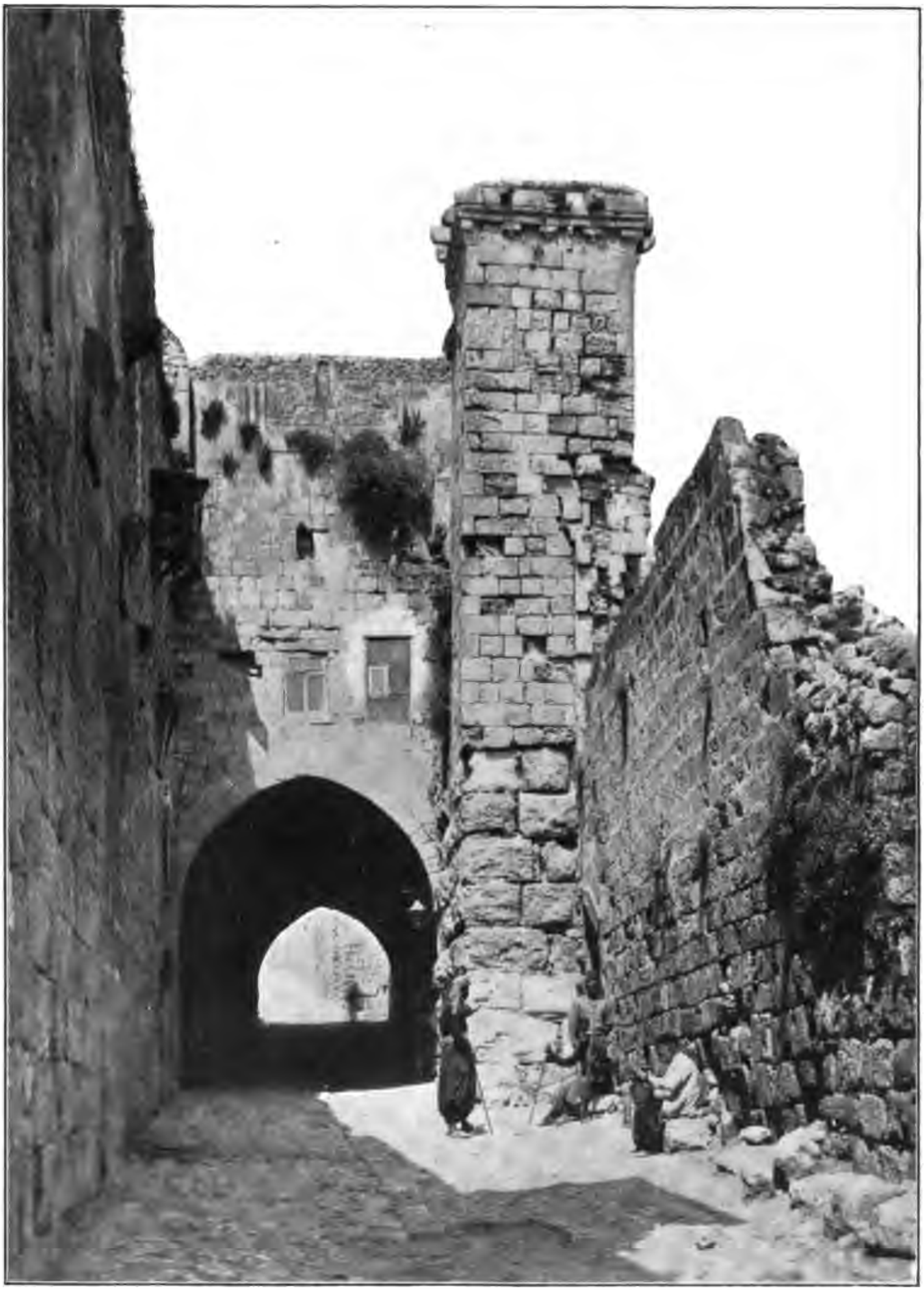
Hydrography.— In Palestine from time immemorial, wells and springs have been held in such veneration, that it is as much sacrilege to destroy a well as to defile a mosque or injure a tomb. The places named from the En spring (or fountain) and the Beer (well), are very numerous. Among these are «the Fountain of Two Calves,» En-Eglaim, near the Dead Sea; the «Fountain of Gardens,» En-gannim, of which name there were two cities, one in Judah and another in Issachar; the «Fountain of the Goat,» Engadi, now Ain Jiddi, on the shore of the Dead Sea, one of Judah's rocky springs; the «Fountain of Sharpness,» or Swiftness, En-Haddah, one of the springs of Issachar's plains; En-Rimmon, in the southern extremity of the land; the «Fountain of the Fuller,» En-Rogel, the spring of Jerusalem, known in early ages, etc. Besides these there were many other fountains all over the land. There was Hagar's «Fountain» or «Well,» Beer-la-hai-roi, in the southern desert, near Beersheba; the «Fountain in Jezreel,» by which Israel pitched in the battle between them and the Philistines; and others. There are the «wells» of the patriarchs in different places — the Well of Abraham at Beersheba, now represented by two, still well filled and surrounded by large stone troughs; the wells of Isaac, south of Gerar, Sitnah, Esek and Rehoboth, of which only the last can be said to have a representative, at Ruhaiben on the great Roman road; the Well of Jacob, dug out of a spur of Gerizim, and close by Joseph's tomb; the Well of Bethlehem, which David knew so well as no doubt the well of his shepherd-boyhood; the Well of Sirah near Hebron, where Abner was overtaken by Joab's messengers. There are a good many modern wells in use, which, though probably the remains of ancient ones, are unmentioned in Scripture. Few of these wells are properly kept, though none are gratuitously destroyed. Some have become quite unserviceable; and even Jacob's Well is in such a state of disrepair (the masonry in the upper part having fallen in) as to require almost a redigging before it can be of use. Elisha's Fountain still pours out its clear current though little care is apparently bestowed on it.

There is but one river worthy of the name in Palestine — the Jordan, one of the most tortuous of streams· always supplied with water, though often so considerably beneath the verge of its banks as to be invisible from any distance. The Jordan originates in streams that come from Lebanon and Hermon, and unite in the Waters of Merom. It falls into the Dead Sea after a course of about 70 miles direct, or 200 including windings. Numerous streams find their way westward to the Mediterranean from Libanus and its prolongations or offshoots as far as the Hills of Judah. Equally numerous streams flow eastward from the same range into the Huleh, Sea of Galilee, Dead Sea and Jordan. Antilibanus, sending its offshoots down the east of Jordan and forming the mountains of Golan, Gilead, Ammon and Moab, is the watershed for a large tract of country between itself and the Ghor or Jordan Valley. Though the rivers are in general small, yet they are not mere summer brooks as many suppose. That but few of the innumerable wadys or water-courses are filled throughout the year is true; but still there are several permanent streams which do good service in the districts through which they pass. Passing by what we may call «Lebanon streams,» which are always vigorous, there is the Zerka, a few miles north of Cæsarea; the Aujeh, a little north of Jaffa, and the Rubin, a little south of this last town; and the Mukutta or Kishon (Kutta-Kishon), which is sometimes, however, low enough, so low that when it reaches the sea it is lost in the sands. None of these are navigable, but they are rivers all the year round, and wide enough to allow boats to ply on them for some little distance. There is a vast number of water-courses in every part of the land, which would make its irrigation minute and complete were the rain sufficient to fill these, or rather sufficiently regulated and distributed over the year to keep these always filled; and were the land property covered and its soil protected by wood, so as to moderate the heat and prevent the excessive evaporation. The words of Moses were true words when he called it «a good land, a land of brooks of water, of fountains and depths that spring out of valleys and hills.» The whole land bears marks of having been better watered than at present, and contains everywhere the remains of artificial appliances, such as terraces, cisterns and wells, by which the rain was regulated and distributed.

The lakes of Palestine are three in number, Merom Tiberias and the Dead Sea, the first seven feet above, the last 1,250 below sea-level. For quiet beauty the Huleh, or «Waters of Merom,» with the adjoining vale, are remarkable, and for subdued attractiveness the Sea of Tiberias; but for brilliance there is nothing to

PALESTINE

Scene on the Jordan River



Court of Antonio, Jerusalem

be compared to the Dead Sea — the ancient Asphaltis. Whatever of tameness there may be about the former two, about this last all is grandeur, notwithstanding the aridity of its shores, and the discomforts of its exceptionally hot climate. The silvery sparkle of its waters arising from their saline and bituminous composition gives a brightness to the scene which is enhanced, not neutralized, by the dark shadows of the Mountains of Moab. These lakes form three singular depressions or troughs in the great natural groove or gorge extending from the Bekâ to the Arabah, about 200 miles. This extraordinary hollow, so far below sea-level, is kept in its present state mainly by its own heat. Were the climate to become temperate, the Sea of Tiberias would rise greatly and transform the Jordan into a Rhine, in parts of the Ghor into a lake; the Dead Sea would swell up and overflow into the Arabah, producing changes in the whole of the southern region which it is impossible to calculate upon. The length of the Dead Sea is 45 miles; its greatest breadth 12. The density of its waters varies between 1,160 and 1,230 (pure water being 1,000). There are ancient shore-lines at a height of 1,200 feet on the surrounding hills.

Geology.— From the southern border of Palestine, where the hill-country of Judah begins, to the extreme north, there is almost unvarying limestone. In passing from Sardinia, Italy, Greece or Asia Minor there is an interesting resemblance, in color, feature and composition, between the rocks of these regions and those of Syria. Syria is, as a whole, a rugged, hilly region composed of limestone of the Secondary period; a country seamed and torn by volcanic action from one end to another; long stripes of depression and ridges of upheaval running parallel; the latter broken across and across into wide districts of tableland interspersed with hollows and valleys, with solitary hills or little groups of clustering peaks. The great masses of rock which constitute the mountains of Palestine and Lebanon are Jura limestone; compact, hard, not rich in fossils, and full of caverns and grottoes. This rock is everywhere the basis on which have been deposited in some parts extensive tracts of volcanic products; as also chalk and chalky limestone, magnesian limestone (dolomite), sandstone, conglomerate, marl, etc. On the west of the Jordan and Arabah the chalk formation which prevails through the southern desert terminates with the desert; and the Jura limestone, beginning with the mountains south of Hebron, holds its course northward, forming the mass of the western hill-country of Carmel and of Lebanon. East of the Jordan and Arabah, where, around Petra, large masses of porphyry, sandstone and limestone lie in close proximity, the same Jura limestone extends northward through the Belkah and the mountains of Ajlûn; and is likewise the basis on which rest the vast volcanic tracts of Haurân, Jaulân and Lejah.

Flora and Fauna.— The flora of Palestine is large and varied; about 1,000 species have been noticed and the whole number is probably at least 2,000. Among the trees are the cedar, oak, ash, olive, palm, sycamore, oleander, walnut, etc. Wheat, barley and other grains are cultivated; the vine is almost neglected now, save in the colonies, some of which have had great success with the orange crop.

The number of mammals inhabiting Palestine is large for the extent of the country, amounting to about 80 in number. Of the wild animals mentioned in the Bible the lion and the *reêm* or unicorn, that is, the aurochs, are no longer found in Palestine. Among carnivorous animals are the wolf, the hyæna, the jackal, the leopard, on the sides of Carmel and Gilead or in the forests of Galilee; and the bear, in Hermon and Lebanon. The wild boar is common and much dreaded by the husbandmen on account of the ravages it commits. Other mammalia are the wild goat, the gazelle, the coney, hare, jerboa, rat, mouse, bat, etc. Of the birds of Palestine there are over 350 species; chief among them are the roller, bee-eater, hoopoe, Smyrna kingfisher, belted kingfisher, sun-bird, great shrike and bulbul. More noticeable than these brightly-clothed birds is the immense number and variety of the larger birds of prey — the vultures, eagles, falcons, griffons, kites, peregrines and buzzards, which abound in every part of the Holy Land, and are at first sight its ornithological characteristic. Reptiles are numerous. They include the land and the water tortoise, the crocodile (leviathan), the chameleon and a variety of lizards and serpents. Fishes are abundant in the Jordan and its affluents, and in the Sea of Galilee are found in immense shoals. The most numerous species are the barbel and the bream. Lower in the scale of animals are the scorpion, the locust, hornet, bee and grasshopper.

History.—The name Palestine, derived from the Hebrew *Pelescheth,* and meaning the land of the Philistines, occurs in this sense in several passages of the authorized version of the Bible, and in several others in the Hebrew, where it is translated *Philistia.* It is properly applicable only to the southwest part of the country, stretching along the shores of the Mediterranean. It appears to have been first used in its more extended sense by Greek authors, and derived additional currency from its adoption by Josephus and Philo. The ancient name of the country was Canaan, which it evidently owed to the descent of its inhabitants from Canaan, the fourth son of Ham, and a grandson of Noah. When thus named, in the time of the patriarchs, it was parceled out among a number of independent tribes or nations; the Kenites, Kenizzites and Kadmonites, on the east of the Jordan; the Hittites, Perizzites, Jebusites and Amorites, in the hill-country of the south; the Canaanites proper, in the centre, from the Jordan to the coast; the Girgashites, on the east shore of the Lake of Tiberias; the Hivites, in the north, among the ramifications of Lebanon; the Philistines on the south, and the Phœnicians on the north coast. In the time of Moses the country east of the Jordan was conquered and divided among the tribes of Reuben and Gad and the half tribe of Manasseh. Under Joshua the work of conquest was carried on to the west of the Jordan; and the whole territory, though not to the extent originally promised, allotted to the remaining half tribe of Manasseh and the other 10 tribes (1445 B.C.); the larger portion of the south falling to the tribes of Judah and Benjamin. Under Solomon the work of conquest appears to have been completed, and all the land which was originally promised was included within the limits of his kingdom. Under his son Rehoboam the kingdom was rent in twain, and subdivided into the separate kingdoms of Judah in the south and Israel in the north. (975 B.C.). The latter kingdom was often designated by the name of Samaria, its capital. The division of the country into tribes was completely broken up by the Captivity, which carried away 10 of them to Assyria and supplied their place by a new colony; and by the subsequent transportation of the remaining tribes of Judah and Benjamin to Babylon. (584 B.C.). After the destruction of the Babylonian Empire Palestine fell under the dominion first of the Persians and then of the Macedonians. When Palestine became the cradle of Christianity with the birth of Jesus Christ, the Romans had established their ascendency and divided the region into four provinces of Galilee in the north, Samaria in the centre, Judea in the south and Perea, which included all the country east of the Jordan. Under Constantine Palestine, now regarded as the Holy Land, acquired new interest and recovered in some degree from the calamities by which it had been laid desolate; and in 396 A.D.. on the division of the empire by Theodosius and the formation of two empires, a western and an eastern. Palestine became a province of the latter. This was its condition at the time when Islamism began to make its conquests. Palestine, unable to offer any resistance, soon fell a prey; and Omar, in 636, after taking possession of its capital, converted it into one of the provinces of his caliphate. The severities exercised toward the Christians having roused the indignation of Europe, gave rise to the Crusades, and Jerusalem became for a time the capital of a Christian kingdom. Ultimately, however, Mohammedanism prevailed, and Palestine sunk into a degraded state; from which it is only now recovering. It is only within the latter half of the 19th century that the exploration of Palestine was first carried out systematically. The most valuable results have been those achieved under the direction of the «Palestine Exploration Fund,» a society organized in 1865 for the purpose of making an exhaustive exploration and an exact survey of the Holy Land. The triangulation of western Palestine was begun in 1871 and finished in 1877. A large and detailed map of the country has been published and an immense mass of valuable information regarding topography, natural history, its interesting ruins, archæological remains and holy places, etc., accumulated. A German society for the exploration of Palestine has existed since 1877. The present population of the country is estimated at 650,000, the Arab element being the prevailing one, and the Arabic language generally in use; fully 125,000 being Jews, whose numbers have increased through the Zionist movement. (See ZIONISM). The people consist partly of the fellahin or settled cultivators, artisans, etc., partly of the nomad Bedouin, who live by rearing cattle or by less reputable means. The country exports some grain, olive-oil, oranges, etc. Jaffa, Haifa and Acre are the chief ports, Jerusalem and Nablus the largest towns. Chapels and monasteries belonging to Greek Orthodox, Roman Catholic and various Protestant churches abound throughout the land, and especially on and near the sites where the principal events connected with New Testament history were enacted. A feature of interest is the great amount of property acquired by the sultan since 1885 in the Jordan Valley and other places, and administered on progressive agricultural principles.

The Nineteenth Century and After.— To get a comprehensive outlook on affairs in Palestine during this period and to gauge the sentiment of its population to-day and of the scattered children of Israel who look upon it as their national home, it is necessary to glance backward through the ages to the year 134, when Hadrian took Jerusalem, suppressed Bar Cochba's revolt in blood and expelled all Jews from Judæa, and trace the many, if feeble efforts of the oppressed people to regain their ancient heritage. A few from time to time migrated to the Holy Land, but the country offered few attractions for traders and artisans. In the 13th and 14th centuries the Mongol and Tartar invasions wrought havoc in the Near East, and Palestine was laid waste with such barbaric thoroughness that it never entirely recovered. The early Turkish sultans were well disposed toward the Jews, as the caliphs had been before them, and granted asylum to the refugees from the Spanish Inquisition. Later sultans were not inimical, even if not friendly disposed, and little waves of immigration from Poland, Russia, Austria and Moldavia arrived at intervals. Napoleon, with his far-seeing instinct, proposed to found a Jewish state in Palestine during the siege of Acre, but his proposal was coldly received in Jewry and was abandoned. A few thousand Jews, virtually all immigrants or the descendants of immigrants, eked out a wretched existence in the decayed towns of Palestine. They were supported to a large extent by the «Chalukah,» or charitable funds to which the Jews of Europe contributed, nominally for the support of poor scholars studying in the Holy Places. The revival of Palestine as a Jewish land may be said to date from about 1840, when Mehemet Ali's claim to Syria directed attention to that part of the Turkish dominions. Lord Palmerston, who had saved the Sultan from his Egyptian vassal, compelled the Turks to protect the Jews from the Druses and the Syrians, and instructed the British consul at Jerusalem to watch over the interests of all Jews. The first Anglican bishop of Jerusalem, appointed in 1841. was a converted Jew. At the same time Sir Moses Montefiore and M. Crémieux, in an unofficial Jewish mission, reawakened the interest of their co-religionists in Palestine as a country to which the persecuted Jews might go. Several small colonies were actually founded, and the Jewish population of the towns began to increase rapidly. The Jews of western Europe and America took little interest in the subject until it was forced upon them by the Russian «pogroms» in 1881–82. Many of the refugees went to the Holy Land, and with help from the West, formed the Jewish colonies which, until the outbreak of the War of 1914, were prosperous. The political side of the movement is generally known under the name of Zionism (q.v.). The settlers suffered by the fall of Abdul Hamid, for the Young Turks made it clear from the outset that they would abolish all special privileges to alien races, and would compel, for example, Christians and Jews to serve in the army. At the outbreak of the war in 1914 there were 125,000 Jews in Palestine, half of whom lived in Jerusalem. All that was needed to assure the growth of Palestine was an honest and benevolent administration, but this the Young Turks could not or would not provide. The course of the war, however, has considerably altered the prospects of Palestine. The British Palestine campaign was prosecuted with great vigor in the closing months of 1917 under General Allenby. On 31 October Beersheba was captured and Gaza was reached on 7 November. The next part of the advance was comparatively simple across the plain of Philistia. The junction of the railway between Jerusalem and Damascus was seized, and Joppa was taken on 17 November. Very difficult country was entered, however, when the British troops climbed into the limestone hills of Judæa. Turkish attacks were incessant; Allenby attacked the Turks northwest of Jerusalem so hotly that they were obliged to draw reinforcements from their lines south of Jerusalem. This made the road from Beersheba, south of Jerusalem, much easier. On 7 December Allenby, again driving from the south, took Hebron, and moved swiftly on Bethlehem, occupying the Jericho road east of Jerusalem. Simultaneously the troops to the northwest virtually joined hands with this force and reached the Schechem road, which runs out of Jerusalem to the north. Jerusalem was completely isolated and the surrender was made without a single shot having been fired into the city, or even into its outskirts. The capture of the capital thus effected, the troops gradually pushed northward, relieving the country, it is to be hoped for all time, of the Turkish usurper. The British occupation means that Moslem, Jew and Christian will receive impartial justice in a land sacred to all. Immediately the proposal for the establishment of a Jewish state in Palestine was touted everywhere, meeting with general favor among the several sections of Jewry. The British government, after a long and careful examination of the scheme, promised to use their best endeavors to carry it out. A large and thriving Jewish settlement in Palestine, under the supervision of Great Britain, or her Allies, would make for progress in the Near East and would thus accord with British policy. It would serve also as a rallying-point for Jews all over the world, and it would confer a benefit also on the Christian and the Moslem worlds, which are equally interested in the Holy Land and its undying religious memories.

Roads and Railways.— The Jaffa-Jerusalem Railway started in 1892 and was reconstructed two years later. Traffic has materially improved in consequence. The gross receipts rose from 519,409 francs in 1895 to 1,388,755 francs in 1911. Two tunnel sections are required to complete the Bagdad line in Asia Minor, bringing Syria through Aleppo in direct communication with Europe, although the sea route from Marseilles, Naples and Trieste is shorter and cheaper for passenger traffic. The main roads in Syria and Palestine, according to the statistics of Dr. Arthur Ruppin in the summer of 1916, have been built under private concessions or by the state, which employs forced labor, so that the war found the roads poorly built and very backward. Military requirements, however, have repaired old roads and built new ones — five in number. The coast road has numerous breaks. With the abolition of personal service and larger outlays for maintenance, a distinct improvement will follow, although much depends on the issue of the war.

Recent Internal Progress.—The opening of a modern school in Jerusalem in 1856 by Elise von Herz-Lämel of Vienna, the founding in 1870 of the Agricultural School at Jaffa by the Alliance Israelite Universelle, and the attempt in 1878, which failed, to establish an agricultural settlement at Petah Tikwah in Judea by Jews from Jerusalem, were the beginnings of a new era for Palestine, which led to more extended colonization in the '80s after the Russian pogroms and after 1897 when the Zionist movement was organized by Herzl at Basle. The promotion of agriculture and handicraft has been affected naturally by the war, but the upward movement continues, with growth in population and resources to which all parts of the Jewish world contribute, chiefly, of course, Russian Jewry at home or in lands to which it may have emigrated. Without accepting the preferred statement of enthusiasts, there can be no doubt that under efficient administration and trained leaders, with diversified crops, the avoidance of needless charity to individuals, and through knowledge of land laws, rural Palestine may witness a new era. The salutary influence of the Anglo-Palestine Bank has already been proved, and the Jewish labor problem will present fewer difficulties in time. Farm schools, reafforestation stations, an agricultural college and an agricultural station, with farms and nursery, have all come into life. The urban development, with 85,000 out of the 100,000 Jews living in 12 cities, offers as serious problems but these will be overcome if present plans are realized. The Tel-Abib Jewish suburb shut off from traffic from Friday sundown to Saturday sundown, with its streets lined with trees, its ample water supply, square-set concrete houses, surrounded by gardens, and 20 minutes by bus from Jaffa, which has there many of its public buildings, is an example of what can be done on modern lines in education, trade and industry. Miss Henrietta Szold has written at length on this subject in the ‘American Jewish Year Book for 1915–16’ (Philadelphia Jewish Publication Society).

Consult Baldensperger, P. T., ‘The Immovable East Studies of the People and Customs of Palestine’ (London 1913); Huntington, H., ‘Palestine and its Transformation’ (London 1911); Leach, C., ‘The Romance of the Holy Land’ (London 1911); Lees, G. R., ‘Village Life in Palestine’ (London 1905); Sidebotham, H., ‘England and Palestine’ (London 1918).

See Bethlehem; Crusades; Jerusalem; Jews; Nazareth; other localities mentioned; and for *Bibliography*, Syria; Palestine Exploration Fund.

PALESTINE, Tex., city, county-seat of Anderson County; on the International and Great Northern and the Texas State railroads, about 130 miles north of Houston. It was settled in 1846, and was chartered as a city in 1846, receiving a new charter in 1905. It is in an agricultural region in which cotton is one of the principal products. In the vicinity are salt mines and deposits of iron ore. The chief manufactures are cotton products, iron products and packed-beef. There is considerable trade in grain, cotton, fruit and vegetables. The prominent buildings are the railroad offices and shops, the Y. M. C. A. building, the churches and schools. A point of interest is Fort Houston, a stockade for protection against the Indians in the early days. The government has been of the commission form since 1909. Pop. 10,482.

PALESTINE EXPLORATION FUND, founded 1864, and incorporated as a society in London, 22 June 1865, for the purpose of systematic and accurate investigation of the Holy Land for biblical verification and illustration. Work began in 1865–66 to determine sites for investigation and to collect information; it was continued from 1867–70 to verify the holy sites; from 1872–77 to survey western Palestine; 1873–74 for archæological research; 1876 to explore the desert of the Tih; 1881 for the survey of eastern Palestine. In 1881 an ordnance survey map of the country was published with descriptive volumes on the topography, physiography, archæology, and other details. Notwithstanding opposition from Turkish authorities in 1882, since then the Dead Sea region and the Wady Arabah have been surveyed; the buried cities in the Tell el Hesy mound have been excavated; also sections of the south and southwestern portion of Jerusalem; and excavations have been carried on at Gath, Gezer, Beth-Shemesh and other localities. The survey of southern Palestine began in 1914 under Captain Newcombe and Messrs. Wooley and Lawrence; operations were naturally suspended during the World War 1914–18, and the fighting in this region which ended in the occupation of Palestine by the British. A *Quarterly Statement* since 1869 and an *Annual* since 1911 are issued by the society, which also maintains an interesting «Palestinian Museum» at its headquarters in London.

Following the British example German, Austrian, French and American explorations have been carried on. The «Deutscher Palästina-Verein,» founded in 1878, made notable surveys east of the Jordan and excavations at Megiddo; Austrian work was accomplished at Jericho and Taanach; French work in Petra, Moab, Edom and eastern Palestine. An American archæological educational institution is maintained at Jerusalem where also is established the well-known Dominican biblical and archæological school.

Among important publications issued by the British Palestine Exploration Fund are ‘Survey of Western Palestine: Memoirs’ (7 vols., 1881–86); Conder, ‘Survey of Eastern Palestine’ (1889); Clermont-Ganneau, ‘Archæological Researches’ (2 vols., 1896, 1899); Bliss and Dickie, ‘Excavations, 1894–97’ (1898); Bliss and Macalister, ‘Excavations in Palestine, 1898–1900’ (1902); Peters and Thiersch, ‘Painted Tombs in the Necropolis of Marissa’ (1905); Macalister, ‘The Excavation of Gezer’ (3 vols., 1912). Consult also Besant, W., ed., ‘Thirty Years' Work in the Holy Land,’ an official summary of the society's work (London 1895); Conder, ‘Palestine’ (in ‘The World's Great Explorers and Explorations,’ London 1889). For French work consult *Revue biblique* from 1892; *Revue de l'Orient Latin* from 1893; for German work, *Zeitschrift des deutschen Palästina-Vereins* from 1878.

PALESTINE PILGRIMS' TEXT SOCIETY, a society founded in London in the early '80s with the object of collecting, translating and publishing the early descriptions of Palestine written by pilgrims between the early Christian centuries and the 16th. The originals were written in Arabic, Hebrew, Greek, Latin, Old French, German and Russian during a period covering about 13 centuries. Among the most celebrated of these are Saint Jerome's ‘Pilgrimage of the Holy Paula’ (382 A.D.) and Bohaedden's ‘Life of Saladin’ (1145–1232). Within 12 years after its foundation the society had completed its original program, having published 14 volumes and a general index (1887–97). The handling of the volumes has been turned over to the Palestine Exploration Fund.

PALESTRINA, pä-lĕs-trē'nä, **Giovanni Pierluigi, (or Pietro Aloisio), Da,** Italian composer and reformer of ecclesiastical music: b. Palestrina (ancient Præneste) 1526 (Haber), or 1514 (others); d. 2 Feb. 1594. He probably studied in the school of music of Gaudio Mell, and in 1551 was appointed by Pope Julius III, master of a choir of boys in the Julian Chapel, Rome, and was the first to receive the title of chapel-master. In 1554 he published a collection of masses dedicated to Pope Julius, who admitted him into the college of choristers of the Pope's Chapel. He was soon appointed chapel-master of Saint John Lateran, and six years later to the same post in Santa Maria Maggiore, in which he continued till 1571. About 1562 the Council of Trent, on reassembling, had taken up, among other subjects, the abuses which had gradually sprung up in church music and which had grown to an intolerable degree. Not only were masses founded on profane airs, often of the most frivolous kind, but the composers of the day, as their manuscripts show, not content with working upon popular airs which suggested the most unbecoming associations, actually imported the words of the profane melodies into their scores. The work of reform was entrusted to the Pope Pius IV, who appointed a commission to inquire into and regulate the matter. As there was no music in existence such as the commission required, however, and Palestrina, almost the only composer from whose works some illustrative fragments could be drawn, was assigned the task of showing that the recommendations of the commission were as consistent with art as with religious usage. In fulfilment of this important task he composed three masses for six voices, which by their artistic beauty and profound devotional feeling at once settled the question beyond dispute. One of them in particular, the ‘Missa Papæ Marcelli,’ so called in gratitude to his patron, at once established for him a position in the highest rank of musical genius, a place to which the subsequent advance of musical science has only confirmed his claim. In reward for this great achievement of his, Palestrina was appointed in 1571 chapel-master of the Capella Gaulia and musical director to the Congregation of the Oratory of Philip Neri. He also became teacher of the musical school founded by Nanini. He likewise undertook the revision of the chants of the Missal and the Breviary. A complete edition of his works was published by Breitkopf and Hartel (1885–93). The music of Palestrina is written in mediæval Church modes and is lacking in emotional expression. It is, however, noble and majestic and well suited for the expression of religious sentiment. Consult Cametti, 'Cenni Biografici di Giovanni Pierluigi da Palestrina' (1895), and the older work of Baini (1828).

PALESTRINA, Italy, a town in the province of and 23 miles east-southeast of Rome. It stands upon the slope of a hill and commands a magnificent view. It was a place of Greek origin, and had become important long before Rome existed. Known under the Roman Empire as Præneste it attained great magnificence, and was often the residence of the emperors. It has numerous ancient remains, particularly those of an immense Temple of Fortune, but the only modern building of note is the Barberini Palace. Pop. 7,000.

PALEY, pā'lĭ, **William,** English divine and philosopher: b. Peterborough, July 1743; d. Bishop-Wearmouth, 25 May 1805. He was educated at Cambridge, and in 1766 became a fellow and tutor of Christ's College. In 1767 he was ordained a priest. He held the tutorship of his college for about 10 years, and his lectures during this period, which were highly successful, contained the elements of his future works. In 1776 he married and gave up his fellowship. Law, bishop of Carlisle, had already presented him with the living of Musgrave in Westmoreland, to which he retired; and he afterward received two other small livings. In 1780 he became prebendary of Carlisle, and in 1785 chancellor of the diocese. In 1794 he was made prebendary of Saint Paul's, and in 1795 sub-dean of Lincoln. His principal works are 'The Principle of Moral and Political Philosophy' (1785); 'Horæ Paulinæ' (1790); 'View of the Evidences of Christianity' (1794); 'Natural Theology, or Evidences of the Existence and Attributes of the Deity collected from the Appearances of Nature' (1802). As a writer Paley was distinguished by clearness and cogency of reasoning, force of illustration, and lucidity of arrangement. He had little claim to originality, and acknowledged in a general way his indebtedness to others and particularly to Tucker; but what he borrowed he generally set in a clearer light, and developed with the practical sagacity and strong common-sense which characterize the best English writers. In his 'Moral and Political Philisophy' he follows the principles of Locke. He rejected the theory of a moral sense invented by Hutcheson to save the morality of the school of Locke, and founded his system purely on utilitarianism. His views may be summed up in his own words: Christian virtue is "the doing good to mankind, in obedience to the will of God, and for the sake of everlasting happiness." The idea of the 'Horæ Paulinæ,' long considered his most original work, is said to have been suggested by Doddridge. The 'Evidences of Christianity' is mainly founded on Lardner's 'Credibility of the Gospel History,' while Butler and others contributed to its completeness, and much of the argument of his 'Natural Theology' has been shown to be taken, without direct acknowledgment, from a work of Bernard Nieuwentyt, a Dutch philosopher of the previous century (1654–1718), on the 'Right Use of Contemplating the Works of the Creator,' an English translation of which appeared in 1718–19. The celebrated illustration of the watch is taken almost literally from Nieuwentyt. However, Paley made no claim for originality in anything but the presentation of his views, so he cannot be charged with plagiarism. His 'Evidences' and 'Natural Theology' are devoted to an attempt to prove the existence of God by the argument from design. Consult Albee, E., 'A history of English utilitarianism' (New York 1902); biographies of Paley by Meadley (1809); Edmund Paley (1824); and Lynam (1825); Stephen, 'History of English Thought in the 18th Century' (New York 1881).

PALFREY, pâl'frĭ, **Francis Winthrop,** American lawyer and soldier, son of J. G. Palfrey (q.v.): b. Boston, Mass., 11 April 1831; d. there, 5 Dec. 1889. He was graduated from Harvard in 1851, was commissioned a lieutenant-colonel in the Civil War and served with gallantry. He resigned in 1863 owing to a severe wound and in 1865 was brevetted brigadier-general of volunteers. From 1872 he was register in bankruptcy. He wrote 'A Memoir of William F. Bartlett' (1879); 'Antietam and Fredericksburg' (in 'Campaigns of the Civil War' series 1882), etc.

PALFREY, John Gorham, American historian and Unitarian clergyman: b. Boston, Mass., 2 May 1796; d. Cambridge, Mass., 26 April 1881. He was graduated from Harvard University in 1815, studied theology and in 1818 accepted the pastorate of the Brattle Street Congregational-Unitarian Church, Boston, succeeding Edward Everett. He resigned in 1830 to accept the chair of sacred literature at Harvard where he remained until 1839, during which period he was dean of the faculty and one of the three preachers at the university chapel. In 1835–43 he was editor of the *North American Review* and early allied himself with the anti-slavery movement; he delivered a course of lectures at Lowell Institute, Boston, in 1839 and in 1842, and in the latter year was elected to the Massachusetts legislature where he served until 1843. In 1844–48 he was secretary of the commonwealth of Massachusetts, and in 1847–49 served in Congress; from 1861–67 was postmaster at Boston and subsequently acted as United States delegate to the Anti-slavery Congress in Paris. He wrote much and forcibly in opposition to the slave power, was an editor of the *Commonwealth* in 1851 and contributed to the Boston *Whig* a series of articles, 'The Progress of the Slave Power,' which attracted much attention. He allied himself with the Free-soil party and was their candidate for governor in 1851. Among his publications are 'Evidences of Christianity' (1843); 'The Relation Between Judaism and Christianity' (1854); 'A History of New England from the Discovery by Europeans to the Revolution of the 17th Century' (1866), etc. The last is his greatest work and a supplementary volume was added by his son F. W. Palfrey (q.v.), 'The History of New England from the Revolution of the 17th Century to the Revolution of the 18th Century' (1890).

PALGHAT, päl-gât', India, town in Malabar district, Madras, 74 miles east of Beypur, and a station on the Madras Railway. It does a flourishing business with the western coast, has a Swiss Protestant missionary station, libraries, reading-rooms, schools and Victoria Jubilee College. Captured by the English in 1768 it served as a base of operations against Tippoo Sahib. Pop. about 50,000.

PALGRAVE, păl'grāv, **Sir Francis**, English historian: b. London, July 1788; d. Hampstead, 6 July 1861. He was son of a Jewish stockbroker; was carefully educated at home; wrote a French version of the Homeric 'Batrachomyomachia' at eight; studied law; was married and became a Christian in 1823, when he changed his name from Cohen to Palgrave, his mother's maiden name. He practised principally in pedigree cases, devoting himself to antiquarian studies; contributed largely to the *Quarterly* and *Edinburgh* reviews; edited for the Crown 'Parliamentary Writs,' 'Rotuli Curiæ Regis,' 'Kalendars of the Treasury of the Exchequer,' and 'Documents and Records Illustrating the History of Scotland'; and wrote 'History of England' (1831, only one volume), 'The Rise and Progress of the English Commonwealth' (1832); 'Truths and Fictions of the Middle Ages: the Merchant and the Friar' (1837); 'The Lord and the Vassal' (1844), and 'The History of Normandy and England' (1851–64). He was knighted in 1832. His work, though faulty in some details, did much to revive popular and critical interest in the Middle Ages.

PALGRAVE, Francis Turner, English poet and critic, son of Sir Francis Palgrave (q.v.): b. Great Yarmouth, 28 Sept. 1824; d. 24 Oct. 1897. He was educated at Charterhouse and Oxford, becoming fellow of Exeter College in 1846. He was employed in the education office after acting as Gladstone's private secretary for a time, and 1850–55 was vice-principal of Kneller Hall, a normal college at Twickenham. He became a friend of Tennyson with whom he passed many summers in Europe, and in 1884 resigned from the education office, in which he had risen to the post of assistant secretary. In the following year he succeeded his old friend John Campbell Shairp as professor of poetry at Oxford. He was a man of remarkable sweetness of character, sensitive and cultured; his book, 'The Passionate Pilgrim' (1858), is a spiritual autobiography, which also gives some light on the facts of his life. He is best known as the critical editor of 'The Golden Treasury' of English lyrics (1861; 2d series 1896), the first volume of which ranks as a classic anthology. He edited several other volumes of selections, from Shakespeare (1865), of hymns (1867), of 'Stories for Children' (1868), of lyrics (1871), from Herrick (1877), from Tennyson (1885), etc., and wrote 'Visions of England' (1881), and 'Amenophis' (1892).

PALGRAVE, William Gifford, English diplomat and Orientalist, son of Sir Francis Palgrave (q.v.): b. Westminster, 24 Jan. 1826; d. Montevideo, 30 Sept. 1888. He was educated at Oxford; went to India immediately after graduation; and entered the Bombay native infantry, which he soon left to become a member of the Society of Jesus and to undertake missionary work in southern India. In 1853 he went to Syria as a Jesuit missionary. He narrowly escaped death in the Damascus massacre of June 1861, being saved only by his perfect coolness and his wonderful knowledge of native dialects and customs. In England, Ireland and France he attempted to rouse indignation at the Syrian massacres. Napoleon III became interested in him, and in 1862 sent him across central Arabia to learn the feeling of the Arabs toward France,— an adventurous journey described in Palgrave's 'Narrative of a Year's Journey through Central and Eastern Arabia' (1865). He decided that there was no chance for Christian missions in Arabia, left (with the consent of his superiors) the Society of Jesus and entered the English diplomatic service. He was sent to Abyssinia in 1865, was British consul in Trebizond 1867, in Saint Thomas 1873, in Manila 1876, in Bulgaria 1878, and in Siam 1879, and in 1884 became minister to Uruguay. He wrote 'Herman Agha,' an Eastern romance (1872); 'Essays on Eastern Questions' (1872); 'Ulysses: Scenes and Studies in Many Lands' (1887), and 'A Vision of Life' (1891), a mystical poem, published posthumously.

PĀLI LANGUAGE AND LITERATURE. — The Pāli is the tongue used in intercourse between the people of culture in the north of India for about 1,000 years from B.C. 700 on. It was owing to this medium of mental interchange that such far-reaching reform movements as Buddhism and Jainism became possible at all in the then totally disrupted condition of the country as a whole. Pāli is the idiom employed in all the earliest inscriptions in India, and had great influence in further developing the languages spoken in India. The canonical books of early Buddhism were written in Pāli, about B.C. 450–250, and in the commentaries on them. In these ancient writings the text itself is referred to as Pāli. The etymological derivation of this word seems plain. It means "rule, canon, a series of canons." Pali, in fact, was generally used by the Buddhists for the space of more than 1,000 years, and is still so used for sacred purposes in Siam, Ceylon and Burma. The first Pāli book published by an Englishman was 'Mahâ Vamsa of Ceylon,' by George Turnour in 1837, he being then colonial secretary in Ceylon. An anthology of canonical verses, edited by Prof. Fausböll in 1855, also appeared. A very good dictionary of Pāli, by R. C. Childers (1872–75) was published. In 1882 the Pāli Text Society undertook the collection and revised publications of the canonical texts.

There were two underlying causes which made Pāli one of the great literary vehicles of the world. The political cause was the establishment of the great state of Kosala and Magadha, right in the heart of the settled Aryan part of India, along about B.C. 650, leading irresistibly to a new standard speech, instead of the hitherto scattered dialects of the group of small commonwealths that had used indiscriminately vernaculars that bore to Vedic Sanskrit about the same relation as did the different forms of speech in Italy to the Roman one, the Latin. When, therefore, Pāli was adopted at the court of Kosala, at Sāvatthi, this fact led to a crystallization and concentration of language for that whole region (about the size of England and Scotland combined) and the surrounding country. And when Gautama Buddha (q.v.), himself a native of Kosala, decided on employing Pāli in his teaching and propaganda work, there was made as important a step forward in the direction of literary unity as was the case when Luther's translation of the Bible in the Middle High German of his time inevitably helped that dialect to the supremacy it has enjoyed in Germany ever since. Later, too, Buddha's disciples likewise compiled the scriptures of their new creed in Pāli, and this form of the native idioms thus became paramount for a long time.

James Prinsep devoted his rare genius to the decipherment of the Pāli inscriptions of northern India, notably those of King Asoka. It was largely due to his labors that Pāli became generally recognized by Western science as the literary tongue *par excellence* of India. How Pāli, however, first originated is still an unsolved riddle. No pre-Buddhistic documents couched in it have so far been discovered.

Professor Franke indeed has shown in his admirable researches and acute deductions that Pāli was a form of Sanskrit retaining much of the earlier forms and grammatical intricacies of Sanskrit which were lost in the later development of that tongue. He also has demonstrated that the type of Pāli employed in the first Buddhistic writings was that of the Avanti district and of its capital, Ujjeni, a celebrated seat of pre-Buddhistic civilization. Mahindâ, the disciple who took the Buddhistic texts to Ceylon, was a native of the Avanti country and presumably taught in Pāli. The earliest canonical texts collected so far may be divided into three classes, or *prithakas* (literally, "baskets"), namely, the *Suttas* (doctrine), the *Vinaya* (rules), and the *Abhidamma* (analytical exercises). Most of the earlier Pāli writings of the order have come down to us in about the same shape in which they were resolved upon and later promulgated by the Council of Vesāli, a century after Buddha's death. It is pretty evident that some of these early books were lost in India, however.

Of other literary works in Pāli, subsequent to the Buddha canon, three only seem to have survived. These are the 'Melindha-penha,' edited by V. Trenckner and translated by Rhys Davids under the caption of 'Questions of King Milinda,' a charming book, a religious romance; then the 'Netti Pakarāna,' edited by E. Hardy, and the 'Petāka Upadēsa.' There are, however, still extant in Burma a number of other Pāli books by unknown authors. In fact, Burma seems to be a treasuretrove in Pāli, as yet quite insufficiently explored. In its many Buddhistic convents there, it is known in a general way, there are hidden away rare manuscripts in Pāli. It is also surmised that Tibet, the west of China adjoining and, possibly, Japan may also hold surprises of the kind in store for the scientific world.

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WOLF VON SCHIERBRAND,
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PALIMPSEST (Greek *palin*, back, again, *psestos*, rubbed), a written page prepared by erasure for being filled with new matter. Both the Greeks and Romans erased manuscripts for the purpose of again using the parchment. Cicero banters his friend the lawyer Trebatius upon his economy in using palimpsests in his correspondence, and expresses the hope that it is his own consultations and not Cicero's letters that he erases. No ancient palimpsests have come down to us. Probably the use of them by the Greeks and Romans was attended with no disadvantage to literature. When, however, the Greek and Roman commonwealths had been overthrown, and almost all the ancient manuscripts preserved in Europe were in the monasteries, the use of palimpsests began to prevail in the Middle Ages. It is still a matter of controversy whether literature has gained or suffered by the practice. On the one hand, it is held that but for the value of their material, the scraps of ancient manuscripts which have come down to us in the form of palimpsests would have been lost. On the other, it is believed that valuable manuscripts have in this way been ruthlessly destroyed.

It was in the 7th century, when Caliph Omar had cut off the supply of papyrus furnished by Egypt, that a great deficiency of parchment was felt. This deficiency continued until the invention of paper. The use of palimpsests increased until the 11th century, when it reached its height. Some declare that nearly the whole of ancient literature was thus lost in the 8th century. From the time of the Renaissance this practice was discountenanced; it was forbidden by edicts, but it did not entirely cease until the introduction of printing. In the East the use of palimpsests began much later, and never became so general as in the West. The scarcity of parchment was increased by the demand for legal documents. The monasteries of Bobbio, Fulda, Saint Gall and Mainz were among the most extensive manufacturers of palimpsests. That which replaced the ancient manuscripts was writing of an ecclesiastical character, lives of the saints and copies of the church services.

At the Renaissance attempts were made to decipher the ancient and underlying writing on palimpsests, but it was not till the 18th century that any progress was made. Knittel (1761) deciphered fragments of a Bible of Ulphilas, and Bruno discovered some entirely new fragments of Livy and Cicero. Niebuhr and others made subsequent discoveries, and the subject was taken up systematically and pursued with great success by Angelo Mai (q.v.), librarian successively of the Ambrosian and Vatican libraries.

The processes employed in deciphering palimpsests vary according to the nature of the manuscripts. Those which have been scraped and rubbed with pumice-stone and afterward bleached are nearly indecipherable. Those which have been merely washed with lime-water and dried are revived by chemical processes. Various recipes which have been found successful are used successively till the right one is found. The result of the researches made is on the whole disappointing, because the monks only made use of imperfect copies and fragments of ancient writings for their palimpsests, and carried on the re-manufacture of clean parchments wholesale, mixing up various manuscripts cutting them into fresh shapes, and thus obliterating forever the connection of the original works. A very large proportion of the discoveries thus made are fragmentary, but many of the fragments are of great value. Among most remarkable discoveries of palimpsests in recent times is that of the Syriac version of the four Gospels by Mrs. Agnes Smith Lewis (q.v.) in Saint Catherine's Monastery, Mount Sinai (1895).

PALINDROME, the name given to any verse or line which reads the same either forward or backward; for example that which is put in the mouth of Satan — *Signa te, signa, temere me tangis et angis* (cross thyself, cross thyself, you touch and torment me in vain), or as «Madam I'm Adam.»

PALINGENESIS. See RECAPITULATION.

PALINURO, pä-lē-noo'rō, **Cape,** Italy, promontory in southern Italy, jutting into the Tyrrhenian Sea, northeast of the Gulf of Policastro; in classical times Palinurum Promontorium, and now sometimes called Cape Spartimento. The end of the cape forms a rocky and dangerous peninsula, on which Roman fleets were wrecked B.C. 253 and 36. The name is Greek and is the origin (not the outcome) of the story of the death and burial of Æneas' pilot, Palinurus.

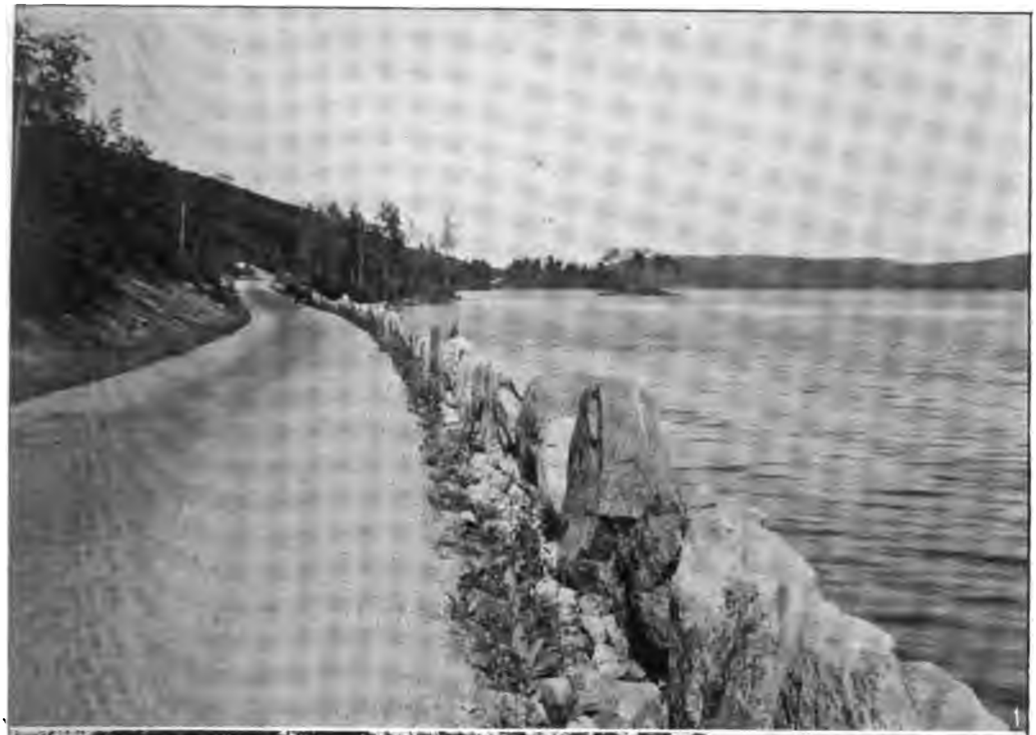
PALISADE CELLS AND PARENCHYMA, elongated cylindrical cells standing upright between the surface layer of the upper side of a leaf (q.v.) and the thicker layer of loose assimilation cells forming the under side. The palisade cells characterize the «palisade parenchyma,» which gives strength to the leaf and contains most of its chlorophyll.

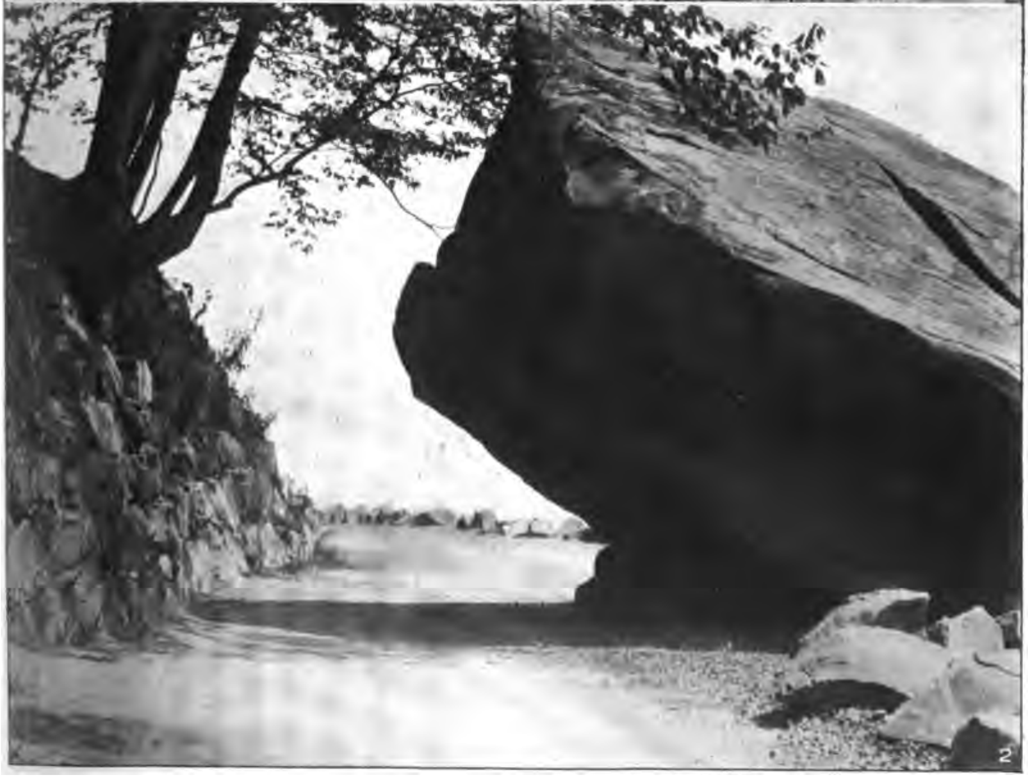
PALISADES, The, a rocky cliff on the right bank of the Hudson River (q.v.), extending from Fort Lee, N. J., to the hills of Rockland County, N. Y., a distance of about 15 miles. They are of basaltic trap rock, a formation which was intruded between layers of sandstone and shale, and cooling in a columnal form, gave these cliffs their peculiar perpendicular formation. They are from 350 to 500 feet in height, broken and fantastic in appearance, and are considered one of the most remarkable and picturesque cliff formations in the world. A considerable amount of rock has been taken from the Palisades for building purposes, and it was feared that they would be badly injured and their beauty destroyed. The two States of New York and New Jersey therefore organized a commission in 1900, known as the Commission of the Palisades Interstate Park, to preserve their natural beauty.

PALISADES INTERSTATE PARK, a great free playground on the west shore of the Hudson River, in the States of New Jersey and New York, extending several miles from Fort Lee northward. In 1900 the two States concerned organized a commission, known as the Commission of the Palisades Interstate Park, the object being «to secure against vandalism and to preserve the natural beauty of the Palisades.» As now constituted the park is made up of four distinct sections — the Palisades (q.v.), beginning at Fort Lee and extending 11½ miles northward; Blauvelt, an acreage lying back from the river, west of Nyack; Hook Mountain, a preserve that stretches entirely along the shore front of that rugged mountain promontory commanding the Tappan Zee, and at one point extending back over the summit to Rockland Lake; and Bear Mountain and Harriman Park, a territory that has its shorefront in the heart of the picturesque highlands of the Hudson, and extends thence back, over mountains and valleys, taking in primeval forests, lakes and streams, to the valley of the Ramapo River in the neighborhood of Tuxedo. Roadways have been constructed in recent years, old piles, drifts and rocks along the beaches have been removed, and walls and a shore path constructed, all of which have added much to the accessibility and appearance of the park. Over 15 docks have been constructed for the accommodation of boats and launches. The New Park Drive is the finest automobile road in the eastern part of the country. The Henry Hudson Drive from Englewood Landing is a beautiful pleasure drive. Camping is permitted under certain regulations as to location, payment of fees, etc. In the summer season several steamers stop at the Park landings, especially Bear Mountain. Several ferries also operate from the New York and Yonkers shores. The West Shore Railroad has a station at Bear Mountain. Work on the drives, approaches, spurs, etc., and landscape work are proceeding gradually due to limited appropriations and also to the delays in taking title, under condemnation proceedings, to pieces of land necessary for through routes. The commission has expended about $500,000,000 for land, building, rights, etc.

PALISOT DE BEAUVOIS, pạ'lē'zō dē bō'vwä', **Ambroise Marie François Joseph,** BARON DE, French naturalist: b. Arras, 1752; d. 1820. He studied law and for some years practised in Paris, after which he became an official in his native province. He soon abandoned official life, however, and began to travel, setting out in 1786 on a trip which took him to West Africa, Santo Domingo and North America. In 1798 he returned to France, was made member of the Institute in 1806, and member of

PALISADES PARK





1 Model highway along the Hudson River in Palisades Park, built by the Park Commission
2 Geological wonder in Palisades Park. Rock was separated during some earth convulsion ages ago

PALISADES PARK

1 Playgrounds overlooking the Hudson River

2 Boy Scout Camp, combining education and recreation

the Council of the University of Paris in 1815. Palisot was opposed to slavery and during his American tour had altercations with William Wilberforce and Thomas Clarkson on the subject. He published 'Flore d'Oware et de Bénin' (1804–21); 'Insectes recueillis en Afrique et en Amérique' (1806–19); 'Muscologie, ou traité sur les mousses' (1812); 'Essai d'une nouvelle agrostographie' (1813); 'Réfutation d'un écrit anonyme' (1814); and the comedy, 'Railleur.'

PALISSY, pä-lē-sē', **Bernard**, French artist and philosopher: b. La Capella Biron (Lot et Garonne), according to D'Aubigne, 1499, according to other biographers about 1510; d. Paris, 1589. Having been selected in 1543 to draw up the plan of a government survey in his neighborhood the remuneration he received enabled him to carry on experiments in enamels, to which his attention had been accidentally turned, and on which he had for some time been engaged. Being ignorant of the art of the potter he had to grope his way, making experiments with all kinds of materials, which for a long time were unsuccessful. He was compelled at last, by his own account, to burn his furniture in order to keep his oven. The fatigue he endured in conducting himself all the operations necessary to the completion of his discovery was excessive. At length, after 16 years of unremunerated labor (1538–54), he succeeded in producing a pure white enamel, affording a perfect ground for the application of decorative art. He was now able to produce works in which he represented natural objects grouped and portrayed with consummate skill. His reputation rapidly spread, and he acquired a patron in the Duke de Montmorency. His sculptures in clay and his enameled pottery once known became recognized as genuine works of art, and came into demand for the decoration of the houses of the great. Religious persecution, however, which had spared him in obscurity, fastened on him as soon as he had begun to attain to wealth and distinction. He was first imprisoned at Bordeaux on the charge of being a Calvinistic preacher (1562), and was threatened with death, when he was rescued by the Duke de Montmorency, who, to save him from the provincial authorities, procured him the title of *inventeur des rustiques figulines du roi*, with which he went to establish himself at Paris. Here he was patronized by Catherine de Medici, who gave him a site for his furnaces on the present situation of the palace of the Tuileries, where the remains of them were discovered in 1865. Here he continued to work for some years. He also gave for several years in Paris lectures on scientific subjects, the substance of which is probably contained in his 'Discours Admirables' (1580). He was the first in France to substitute facts and demonstrations in the teaching of science for mere hypothesis. He established a rational theory of crystallization, and his classification of salts was nearly perfect. His teaching again excited the jealousy of his theological opponents. He was arrested in 1588 and thrown into the Bastile, where he died at the age of 90, according to D'Aubigne, who knew him personally; or of 80, according to his other biographers. His 'Complete Works' (1880) contain his famous autobiography. A monograph on the artistic work of Bernard de Palissy by C. De Lange and C. Borneman appeared in 1863–65. A biography of him has been written by Henry Morley (1852).

PALISSY WARE. See PALISSY, BERNARD.

PALK (pâk) **STRAIT**, the northern and narrower part of the channel separating Ceylon from the southeastern coast of India, the southern and wider part being the Gulf of Manaar. The strait is 80 miles long, 40 to 85 miles wide, but shallow and scarcely navigable. The Pambam Passage broken with islands connects the two parts of the channel.

PALKI. See PALANQUIN.

PALL, pâl (Lat. *palla*), generally, the covering of a bier, but specially applied to the small linen cloth, usually stiffened with cardboard, employed to cover the chalice. The upper part of the pall may be of silk, and colored according to the season. It is often richly embroidered. While part of the corporal is sometimes laid over the chalice as a covering, the pall or palla, according to Pope Innocent III, is not to be considered identical with the corporal. See COSTUME, ECCLESIASTICAL.

PALL-MALL (pĕl-mĕl) **GAME**, an ancient pastime in which a round box-wood ball was struck with a mallet or club and sent through a ring elevated upon a pole, standing at either end of an alley. The game was formerly practised in Saint James' Park, London, and gave its name to the street called Pall Mall.

PALLACEÆ, the stink-horn toadstools. See FUNGI.

PALLADIAN ARCHITECTURE, a variety of 16th century Italian architecture so named from Andrea Palladio (q.v.). It was founded upon the Roman antique as interpreted by the writings of Vitruvius, but rather upon the secular buildings of the Romans than upon their temples. It is consequently more applicable to palaces and civic buildings than to churches. A characteristic feature of the style is the use of engaged columns in façades, a single range of these often running through the two principal stories. It was introduced into England by Inigo Jones, a follower of the Venetian school of Palladio.

PALLADINO, päl'lạ-dē'nō, **Eusapia**, famous Italian medium: b. 1854; d. May 1918. Her mother died in giving her birth and her father was murdered by brigands a few years later. Of humble origin, she began to work as a kitchen-maid in Naples, and while serving in that capacity she was on one occasion invited by the family to take part in a spiritualistic séance, from which it developed that she possessed remarkable psychic powers. In 1888 she attracted the attention of the scientific world; Professor Lombroso and other scientists went specially to Naples to investigate; committees of investigations were held in Rome, Paris, New York, Cambridge and Warsaw; Sir Oliver Lodge, Professor and Madame Curie, F. W. H. Myers (author of 'Survival After Death'), Richet and Schiaparelli were attracted to and baffled by the mystic phenomena presented by this Italian woman. She converted the scepticism of Lombroso into a faith in spiritualism and led him to write a minute account of her physical peculiarities. A vast literature arose on the subject, and Palladino became the greatest celebrity in the annals of psychical research in Europe and America. Despite the proven fact that she practised fraud at times, the supernormal character of certain physical phenomena which occurred in her presence has never been explained. For over 20 years she remained an unsolved puzzle and defied solution at the hands of many sceptical investigators. She was able to produce levitations of furniture, graspings by livid hands, the playing of musical boxes and apparitions of the dead. She operated in the light as well as in the dark; a person of very ordinary intelligence, she did not appear to have understood herself the mysteries she provoked.

PALLADIO, pāl-lă'dē'ō, **Andrea,** Italian architect: b. Vicenza, Venetian territory, 30 Nov. 1518; d. Venice, 19 Aug. 1580. He was originally a stone-cutter, and at the suggestion of the poet and savant Trissino (see TRISSINO, GIOVANNI GIORGIO), went to Rome for the purpose of studying ancient and modern art. Returning to his native country he designed many palaces and county houses of great beauty and dignity. His designs were also sought in England and other parts of Europe. Palladio belongs to the masters who, in the 16th century, by the study of the works of Roman builders, created a new era in architecture. Among his works the Theatre degli Olimpici, in his native place, is the most important. Venice also owes to him many of her finest buildings. The villa built by Lord Burlington at Chiswick (since enlarged by James Wyatt) was from a design of Palladio, as was also a bridge at Wilton, the seat of the Earl of Pembroke. The majestic simplicity of antiquity was always present to his mind, and Algarotti called him the Raphael of architects. His published works include ‘Antichitâ de Roma’ (1554), and ‘Quattro libri dell' architettura.’ He also provided designs for Barbaro's edition of ‘Vitruvius’ and illustrated Cæsar's ‘Commentaries.’ His life was written by Temanza (1763). Consult the biography by Fletcher (1902).

PALLADIUM, among the Greeks, a statue or image of Pallas (Minerva), which is said to have fallen from heaven, and to have been found by Ilus, who placed it in a temple in his new city (Ilium). It was believed by the Trojans that their city would be invincible so long as it contained the Palladium. Ulysses and Diomedes, to remove this impediment to the capture of the city, are said to have carried it off. The Romans, however, pretended that it was brought to Italy by Æneas and preserved in the temple of Vesta at Rome. It was considered holy and the protecting divinity of the city. The term palladium has figuratively acquired the sense of bulwark, protection, sanctuary.

PALLADIUM, atomic weight 106.20, a metal resembling platinum, discovered by Wollaston (1803) while purifying a quantity of crude platinum. Occurs native in platinum ores, but principally alloyed with gold and silver in a gold ore from Brazil. Obtained from these ores by complicated processes which ultimately give the palladium as palladium cyanide. This decomposes on ignition, giving pure spongy metallic palladium. A ductile, malleable, white metal, specific gravity 11.50 and having the lowest melting point of all the platinum metals. It is not acted on by atmospheric oxygen or moisture slowly attacked by strong nitric, hydrochloric, or sulphuric acids, but very easily by aqua regia. In the spongy form it has the power of absorbing gases. Freshly ignited palladium will absorb about 350 times its own volume of hydrogen at room temperature and nearly twice as much when heated to the temperature of boiling water. It forms two compounds with oxygen PdO, palladous oxide, and PdO_2, palladic oxide. Two classes of salts are known related to these two oxides, the palladous salts being the most important. Palladium is used in the manufacture of many fine scientific instruments because of its properties of hardness, color and resistance to the action of the atmosphere, and in jewelry and dentistry is replacing platinum. The nickel ores of Sudbury, Canada, are capable of producing more than the present world's supply of this metal.

PALLADIUS, pą-lā'dĭ-ŭs, Greek patristic writer of the 4th century. His ‘Historia Lausiaca’ dedicated to Lausus, chamberlain of the Imperial Court, gives us the results of his journeys among the principal districts of the Roman Empire, where monks and hermits had settled. He is indeed the Herodotus of the early Church, whose self-chosen task was to travel from one religious house or colony to another, curiously inquiring about the life of each, and picking up from the gossip of the highway or actual observation a rich fund of information which has enabled him to give a living picture of the ascetic phase of church life in Palestine, Egypt and Syria. His works are published in Migne's ‘Patrologia Græca’ (Vol. XXXIV). Consult Presschen, ‘Palladius and Rufinus’ (1897).

PALLADIUS, Peter, Danish leader of the Reformation: b. Ribe, 1503; d. 1560. Palladius was rector of a church at Odense in 1530, when he became a convert to the new doctrines of the Reformers. In 1531 he journeyed to Wittenberg where for six years he studied under Luther and Melanchthon, and was made a doctor of theology. Christian III appointed him bishop of Zealand in 1537 and also appointed him to the chair of theology at the university. Palladius worked earnestly and successfully, spreading the Reform doctrines throughout the 390 churches under his jurisdiction. He translated Luther's Little Catechism; compiled a ritual and service book and published a revision of Pedersen's Bible in 1550. In all he prepared over 50 works in Danish and Latin, including the ‘Visitatsbog’ (1540). Consult the edition of his works by Lis Jacobsen (1911 et seq.).

PALLADIUS, Rutilius Taurus Æmilianus, a Roman writer of the 4th century of our era. He wrote ‘De re rustica,’ a didactic work in 14 books on agriculture, the topics being arranged according to the seasons, and forming a sort of farmer's calendar. The first book is introductory, and the last, written in elegiac distichs, is a poem on the art of grafting, the other 12 containing accounts of the agricultural and gardening operations for each of the 12 months. Much of the work is simply borrowed from earlier writers. The poem was popular in the Middle Ages and there is an English translation of it belonging to the 15th century.

An English translation by Thomas Owen appeared in 1803, and others have followed.

PALLAH, or IMPALLA, a large reddish, bushranging South African antelope (*Æpyceros melampus*), called «roibok» by the Boers. The horns were lyrate, abruptly bent and were possessed by the males alone. These animals were formerly numerous, but were not only especially a prey to the large carnivores, but were shot wrathfully by Boers and sportsmen because they were extraordinarily suspicious and alarmed all the game in the neighborhood by loud whistling cries the moment they discovered a hunter's presence. Now, therefore, they are rare. Consult the works of sportsmen-naturalists in Africa; and Lydekker, ‘Book of Antelopes’ (1896); Sclater, ‘Fauna of South Africa, Mammals’ (1900).

PALLAS, păl'ạs, freeman and favorite of the Roman emperor Claudius: d. 63 A.D. He was a slave of Antonia, mother of Claudius; was set free by his master when he became emperor; together with Callistus and Narcissus was the real power during Claudius' reign; induced the emperor to marry Agrippina, his own niece, and to adopt Nero; and with the connivance and assistance of Agrippina, now his mistress, poisoned Claudius and brought Nero to the throne. He was subsequently poisoned by Nero's order.

PALLAS, päl'läs, **Peter Simon,** German naturalist and traveler: b. Berlin, 22 Sept. 1741; d. there, 8 Sept. 1811. He studied there, in Leyden, and in England, devoting himself especially to the classification of collections of zoological specimens, and in 1768 was invited by Catharine II of Russia to become adjunct of the Saint Petersburg Academy and to lead a scientific expedition through Russia in Asia. This trip of exploration, undertaken with Sokoloff, Suyeff and Rytchkoff, and lasting more than six years, was his greatest work, the specimens collected forming the nucleus of the Academy's museum in Saint Petersburg. In 1777 he became a member of the Imperial Topographical Survey, and in 1787 was appointed historiographer of the College of Admiralty. He retired in 1796 and returned to Berlin not long before his death. His published works include a description of his travels in Asia (1771–76), ‘Flora Rossica’ (1784–1815); ‘Icones Insectorum’ (1781–98); a study of the Mongolian races (1776–1802); and a great and incomplete ‘Vocabularium Linguarum totius Orbis’ (1787–89).

PALLAS, păl'ạs, *in astronomy,* one of the minor planets revolving round the sun between Mars and Jupiter. It was discovered in 1802 by Olbers at Bremen. It revolves round the sun in 4.61 years. The eccentricity of its orbit is 0.23969, and its semi-axis major is 2.77 times that of the earth's orbit. Its diameter is 172 miles. When nearest the earth in opposition, Pallas shines as a full seventh-magnitude star, with a decided yellowish light.

In Greek mythology, the goddess of wisdom. See MINERVA.

PALLAVICINO, päl-lä-vē-chē'nō, **Ferrante,** Italian satirist: b. Piacenza, 1618; d. Avignon, 6 March 1644. He took orders; became a canon of Augustine; had to escape to Venice because of his broken vows; wrote there against Odoardo, Duke of Plaisance, but had to leave Venice in turn because of his immoral life and writings; spent some time in Germany; again went to Venice, where he was imprisoned, but soon set free; then broke entirely with the Church and bitterly and foully attacked the Pope in ‘Il divorzio Celeste.’ Venturing into France he was arrested by the papal officers, found guilty of heresy and beheaded.

PALLAVICINO, päl'lạ-vē-chē'nō, **Sforza,** Italian cardinal and ecclesiastical historian: b. Rome, 1607; d. there, 1667. He was educated in the Collegio Romano; was made governor successively of Iesi, Orvieto and Camerino by Urban VIII; at 30 entered the Jesuit Order; soon afterward became professor of philosophy and theology in the Roman College; and made such a name by his philosophical treatises that he was chosen by the Catholics to write a party history of the Council of Trent which refuted the work of Paolo Sarpi.

PALLEN, Condé Benoist, editor, poet and essayist: b. Saint Louis, Mo., 5 Dec. 1858; descended from two of the oldest French families among the pioneers of the Louisiana Purchase. Dr. Pallen made his college course at Georgetown University, District of Columbia (A.B. 1880; A.M. 1883; LL.D. 1896); took a special course of study at Saint Louis University; received the degree of Ph.D. in 1885. For 10 years (1887–97) he edited the *Church Progress* of Saint Louis; since 1885 has been a well-known figure in the lecture field on literary, philosophical and economic subjects. He is author of ‘The Philosophy of Literature’; ‘Epochs of Literature’; ‘What is Liberalism’; ‘New Rubaiyat’; ‘The Feast of Talarchus’ (dramatic poem); ‘The Death of Sir Launcelot, and Other Poems’; ‘The Meaning of the Idylls of the King’; and ‘Collected Poems.’ His interpretation and comments on the «Idylls» drew from Tennyson himself a personal letter of congratulation and appreciation. He has been a contributor to magazines for the past 30 years; Catholic revisory editor of ‘The New International Encyclopedia,’ and the ‘Encyclopedia Americana’ (1st edition), and managing editor of the ‘Catholic Encyclopedia’; president of The Encyclopedia Press, Inc., since 1912.

PALLIS, pạl'lēs, **Alexander,** Greek litterateur: b. Pieræus, Greece, 1851. Pallis became a firm advocate of the popular Greek speech as opposed to the literary language affected by the Church and press and gained notoriety by a popular version of the Gospel of Matthew, which appeared in the journal *Akropolis.* Riots ensued and the Synod prohibited all modern Greek versions of the Scriptures in Greece. In 1902 in Liverpool, England, he published his translation of the four Gospels and the following year witnessed the publication of ‘A Few Notes on the Gospels according to Saint Mark and Saint Matthew.’ In 1904 he was joint translator of Kant's ‘Kritik’ and in the same year published a version of the ‘Iliad.’ In 1906 appeared a version of Euripides' ‘Cyclops’ and in 1907 an original volume of ‘Poems.’ Pallis has for several years been engaged in mercantile pursuits in Liverpool. Consult Krumbacher, K., ‘Das Problem der neugriechischen Schriftsprache’ (Munich 1902).

PALLISER, păl'ĭ-sėr, Sir **William,** British inventor and engineer: b. Dublin, 18 June 1830; d. 4 Feb. 1882. He passed through the Staff College at Sandhurst, and in 1855 obtained a commission in the Rifle Brigade, was subsequently transferred to the Hussars and retired from the army in 1871. Besides inventing the projectiles and guns which bear his name he devised many improvements in fortifications, etc. He was knighted in 1873, and for a few years sat in the House of Commons as Conservative member for Taunton. See Projectiles.

PALLIUM, an article of ecclesiastical dress consisting of a band of white wool, some three inches wide, with two narrower bands of the same material, one of which hangs down the back and the other over the breast. It is embroidered with four purple crosses. It is a part of the vestments of the pope, patriarchs and archbishops; and is sent by the pope to the patriarchs and archbishops as a token that they are invested with the fullness of the episcopal office. It is sometimes, though rarely, also sent to bishops. When a bishop is elected or appointed to a metropolitan see, he at once solicits the pallium from the pope within three months after his consecration or confirmation. The pallium is made from the wool of two lambs annually presented in the church of Saint Agnes, Rome, by the apostolic sub-deacons, and woven by the nuns of Torre de' Specchi, to whom alone belongs the privilege. The historical origin of the pallium is not known or at least wrapt in such obscurity that no definite conclusion has ever been arrived at. Some writers believe that it was first conferred upon bishops by the emperors as a mark of dignity, and then passed over to a purely ecclesiastical usage. It is only worn on occasions of great solemnity. Consult Thurston, 'The Pallium' (London 1802); Vespasiani, 'De Sacri Palli Origine' (Rome 1856).

PALM, päm, **Johann Philipp,** Bavarian bookseller and publisher: b. Schorndorf, Bavaria, 1768; d. Braunau, Bohemia, 26 Aug. 1806. The firm of which he was a member published a pamphlet, 'Germany in Her Deepest Humiliation' (1806), which was hostile to Napoleon and his measures. It was brought to the attention of Napoleon, who ordered the arrest of Palm, had him tried by court-martial, and though the pamphlet was to the publisher merely trade matter, he was sentenced to death and executed at Braunau on the following day. This act aroused the deepest indignation in Europe as well as in Germany, where the hatred of the Germans for Napoleon was already intense. Consult Schultheiss, 'Johann Philipp Palm' (1860).

PALM BEACH, Fla., winter resort in Palm Beach County, on the Florida East Coast Railroad, the East Coast Canal and Lake Worth, 300 miles southeast of Jacksonville. Its climate, location and ample facilities for boating, bathing and fishing combine to make Palm Beach the most popular of winter resorts. There are a number of palatial hotels and beautiful parks. Farming and fishing interests are considerable and the reclamation of the Everglades is making a large acreage available for tillage. Pop. (permanent) 1,200; (winter) 6,000–7,000.

PALM BUTTER, OIL, SUGAR, WAX. See Palms.

PALM-CAT, or **PALM-CIVET,** any of several animals of the civet family (*Viverridæ*), and of the genus *Paradoxurus,* known also as tree-cats, toddy-cats, from their habit of climbing palm-trees to eat their fruit. They inhabit India and southeastern Asia, the Malay Archipelago, etc., and somewhat resemble large cats with comparatively short legs. The best known is the Indian species (*P. niger*), which is often kept about houses and subsists mainly on animal food, such as rats, small birds, lizards, etc. Consult Blanford, Jerdon, Blyth, Wallace and other authorities on East Indian zoology; and Allen's Natural History, article 'Cats, Civets and Mungooses' (1894).

PALM-CRAB, a large burrowing land-crab which feeds upon cocoanuts. See Robber-Palm.

PALM-KALE, a variety of cabbage extensively cultivated in the Channel Islands and also in Italy. It grows to the height of 10 or 12 feet, and with a crown of leaves at top it has much the aspect of a palm.

PALM OIL. See Palms.

PALM SUNDAY, the Sunday next before Easter Day, so called because on that day is celebrated Christ's last entry into Jerusalem before his Passion, where palm branches were strewn in his way by the multitude. In some churches palms are employed as decorations at the services on this Sunday, and fragments of them distributed to the people.

PALM-SWIFT. See Swift.

PALM-WEEVIL, or **GRUGRU,** a large curculionid beetle (*Rhyncophorus palmarum*). See Grugru.

PALMA, Giacomo, jä-kō'mō päl'mä, called Il Vecchio, Italian painter: b. probably Serintola, near Bergamo, about 1480; d. Venice, 1528. He is supposed to have been a pupil of Giovanni Bellini, but little is known regarding his life. It may be divined from the pictures that go by his name that he imitated one after another several great artists of the Venetian school and many of his works have been attributed to Giorgione, whose coloring he took for his standard of excellence. The Italian churches have multitudinous examples of paintings called "Santa Conversatione" representing the Virgin and the Child, and the donor of the picture presented to them by his patron saint. Of these large compositions Palma Il Vecchio painted very many. He was also successful in mythological subjects, and his landscape backgrounds are exquisite. His works place him among the foremost painters of his time. Some of his best-known paintings are 'Adoration of the Shepherds'; 'The Holy Family'; 'Mars and Venus'; 'The Mystical Marriage of Saint Catherine'; 'Divine and Heathen Love'; 'Portrait of Andrea Palladio in his Youth.'

PALMA, Giacomo, called Il Giovane, Italian painter, grand-nephew of the Elder Palma: b. Venice, about 1544; d. there, 1628. His early work was excellent, comparing in fresh coloring with Titian, who greatly influenced him. Later his vicious mannerism grew so as to be a predominating feature of his work.

Hence Lanzi called him the last good and first bad painter of Venice.

PALMA, Ricardo, Peruvian author: b. Lima, Peru, 7 Feb. 1833. He was exiled to Chile in 1860 as a result of implication in a political revolt, but upon his return became secretary to President Balta. Later he served as senator and then was assistant in the National Library. After the sack of the library by the Chileans in 1881 he reorganized it, gathered remaining fragments and assisted by gifts from foreign governments succeeded in reopening the library in 1884. In 1886 he promoted the agitation which resulted in the expulsion of the Jesuits from Peru. He is the author of several works of fiction, some poetry, the historical work 'Anales de la Inquisción de Lima' (1863), 'Poésias' (1887) and 'Tradiciones y articulos historicos' (1899), recording the traditions and legends of Peru.

PALMA, Thomas Estrada, Cuban patriot: b. Bayamo, Santiago province, Cuba, 15 July 1835; d. Santiago province, Cuba, 4 Nov. 1908. He studied law, but did not practise; during the revolution of 1868–78 rose to be a general in the Cuban forces; after nearly nine years of service was captured and imprisoned in Spain until the close of the insurrection. At the time of his imprisonment he had succeeded Cespedes in the rather empty honor of President of the Cuban provisional government. After his release he went to Honduras, where he became Postmaster-General of the republic. Later he removed to the United States, where he opened a school for Latin-Americans at Central Valley, N. Y. This institution he successfully conducted until the beginning of a fresh revolt in Cuba in 1895, when he was elected delegate-at-large and Minister Plenipotentiary of the Cuban republic and took charge of the well-known Junta in the United States, which purchased arms, organized filibustering expeditions and otherwise aided the army in the field. In 1901 Palma was almost unanimously elected President of the republic and on 20 May 1902 was inaugurated, the United States on that day turning over to the new government the administration of the internal affairs of the nation. On 23 Sept. 1905 he was again elected to the office of President but resigned 28 Sept. 1906.

PALMA, (1) the capital of Majorca (q.v.), the largest of the Balearic Isles and of the Spanish province of Baleares, on the Bay of Palma indenting the south coast. The city, encircled by a fortified wall, stands in the midst of orange plantations and with its Moorish architecture has a very picturesque effect. It is one of the most aristocratic of European cities. A railway connects it with Manacoar on the east coast. Its chief edifice is the Gothic cathedral (1322–1601); it contains the tomb of King Jayme II of Aragon and a valuable collection of church ornaments. In the church of Saint Francis is the tomb of Raimon Lully (q.v.). Other notable structures are a fine exchange (1426–46), an old Moorish palace, a 16th-century town-hall and several fine modern buildings and institutions. Its numerous manufactures include woven silks and woolens, jewelry, etc., and it has considerable trade in wine, oil, cattle and agricultural produce. Its fine harbor is protected by a mole. Pop. about 68,000.

(2) A town of Sicily, 14 miles southeast of Girgenti. Pop. 11,702. (3) The name of one of the larger of the Canary Islands (q.v.).

PALMA CHRISTI. See CASTOR-OIL PLANT.

PALMÆR, pal-mär', **Vilhelm,** Swedish chemist: b. Forsvik, Skaraborg, 1868. He received his education at the universities of Upsala and Göttingen, held several teaching positions and in 1907 was appointed to a chair in the Stockholm Technical College. He traveled in Germany, France, America, Switzerland and England. Dr. Palmær has been secretary to the Nobel committee of the Academy of Sciences since 1900. His published works include 'Ueber der Mirkungsart der Tropfelektroden' (1898); 'Chemische Nachweisung der Konzentrationsänderungen bei Tropfelektroden' (1899); 'A Brief Account of Dr. V. Palmær's Electrolytic Process for Producing Bicalcic Phosphate' (1904) and contributions in scientific journals and periodicals.

PALMAS, päl'mäs, **Cape.** See CAPE PALMAS.

PALMER, päm'ėr, **Alice Freeman,** American educator: b. Colesville, N. Y., 21 Feb. 1855; d. Paris, France, 6 Dec. 1902. She was graduated from the University of Michigan in 1876. From 1877 to 1879 she was principal of the high school at East Saginaw, Mich., becoming in the last-named year professor of history in Wellesley College. In 1882 she became acting president and later president of that institution, which position she retained till her marriage in 1887 to Prof. G. H. Palmer (q.v.) of Harvard University. During her administration the standard of scholarship was raised, the number of students very greatly increased and several important buildings added. In 1892–95 she served as non-resident dean of the woman's department of the University of Chicago. She took an active interest in educational and reform associations, was a member of the Massachusetts State board of education from 1889.

PALMER, Anthony, American colonial governor: b. England, about 1675; d. Philadelphia, Pa., May 1749. He was a merchant in Barbados for some time, but in 1707 purchased a large tract of land in Philadelphia where he then settled. In 1708 he was a member of the provincial council and served until his death. When Lieut.-Gov. George Thomas resigned in 1747 the government devolved upon Palmer, who was president of the executive council, and during the succeeding 18 months he administered the affairs of the colony with much ability. He conciliated the Indians and took precautions for the military defense of the colony against Spain and France, though opposed by the Quaker members of the council. The «Kensington District» of Philadelphia was originally a portion of his farm.

PALMER, Arthur Hubbell, American Germanic scholar: b. Cleveland, Ohio, 30 June 1859. In 1879 he was graduated at Western Reserve University and subsequently studied for two years in Europe. From 1883 to 1891 he was professor of the German language and literature and from 1886 to 1891 also served as librarian at Adelbert College. Since 1891 he has held the chair of German language and literature at Yale University. Professor Palmer is a trustee of the American Scandinavian Foundation of New York. He has edited Riehl's 'Burg Neideck' (1893); Schiller's 'William Tell'; with Introduction, Notes and Vocabulary' (1898; 1915); Schiller's 'Thirty Years' War' (1899); Gœthe's 'Hermann und Dorothea' (1903); translations of Björnson's 'Poems and Songs' (1915).

PALMER, Sir Charles Mark, English ironmaster and shipbuilder: b. South Shields, 3 Nov. 1822; d. London, 4 June 1907. He was educated for a commercial career in France; was partner in several coal companies; reformed the coal-carrying trade from the north of England by building screw colliers (1852), which drove the sailing brigs out of business; and at Jarrow established a great shipyard. Both iron and coal for this yard are supplied by Palmer's own mines. He introduced the use of rolled plates for men-of-war; held several important government contracts; and was a member of the House of Commons, 1874–1907. He was created a baronet in 1886.

PALMER, Edward Henry, English Oriental scholar: b. Cambridge, 7 Aug. 1840; d. Arabia, 1 Aug. 1882. He was educated at Saint John's College, Cambridge, and later made extensive journeys of exploration in the East. In 1871 he was appointed professor of Arabic at Cambridge and from that time onward accomplished a vast amount of literary work. In 1874 he was called to the bar. In 1882 he was engaged by the British government to assist in keeping the Arabs of the Sinai region quiet and preventing them from interfering with the Suez Canal, when he was captured and murdered with two other Englishmen. He had a remarkable knowledge of Oriental life and language and was a man of very varied gifts. His works include 'Oriental Mysticism' (1867); a 'Grammar of the Arabic Language' (1874); 'A Concise Dictionary of the Persian Language' (1876); 'The Song of the Reed' (1877), comprising Persian verse translations and original poems; 'The Poetical Works of Behá-ed-Din Zoheir of Egypt, with a Metrical English Translation, Notes and Introduction' (1876–77); a translation of the Koran ('Sacred Books of the East,' 1880); a 'Life of Haroun Alraschid' (1881); an Arabic manual (1881); and a 'Simplified Grammar of Hindustani, Persian and Arabic' (1882). Consult 'Life' by Besant (1883).

PALMER, Erastus Dow, American sculptor: b. Pompey, N. Y., 3 April 1817; d. Albany, N. Y., 9 March 1904. His best-known works were 'Morning and Evening'; 'The Angel of the Sepulchre': 'The White Captive'; 'Landing of the Pilgrims' (a group of 15 life-size figures intended for the Capitol at Washington). He also executed many portrait busts and statues, including the statues of Washington Irving, Alexander Hamilton and Robert R. Livingston, the latter in the national Capitol. The Livingston statue brought him a gold medal at the Centennial Exposition in Philadelphia in 1876 The 'Indian Girl' at the Metropolitan Museum in New York was the first full length figure he attempted.

PALMER, Frederick, author and war correspondent: b. Pleasantville, Pa., 29 Jan. 1873. He was graduated at Allegheny College 1893; acted as correspondent during the Greco-Turkish War '97; Alaskan sledge journey, Philippine '98; March to Peking, 1900; Siberian travel, 1902; with Kuroki's army for *Colliers* and *London Times,* 1904–05; cruise American battleship fleet, 1908–09; Mexico and Central American travels, 1909; Balkan War, 1912; Mexico, 1914. Chosen as the one accredited correspondent to represent the American press with the British army, 1914–16, and various smaller campaigns. Author of 'Going to War in Greece'; 'The Ways of the Service'; 'The Vagabond' (novel); 'With Kuroki in Manchuria'; 'Central America and Its Problems'; 'The Last Shot' (novel) and 'My Year of the Great War.'

PALMER, George Herbert, American educator and classical scholar: b. Boston, 19 March 1842. He was graduated from Harvard in 1864, studied at the University of Tübingen, 1867–69 and at Andover Theological Seminary in 1870; and after serving as tutor in Greek at Harvard, 1870–73; assistant professor, 1873–83, and professor of philosophy, 1883–89, became Alford professor of natural religion there in 1889, and professor emeritus 1913. He published a rhythmic prose translation of the 'Odyssey' (1884); 'The New Education' (1887); 'The Glory of the Imperfect' (1898); 'Self Cultivation in English' (1897); 'The Antigone of Sophocles,' a translation (1899); 'The Field of Ethics' (1901); 'The Nature of Goodness' (1904); 'The English Works of George Herbert' (3 vols., 1905); 'The Life of Alice Freeman Palmer' (1908); 'The Teacher' (1909); 'The Problem of Freedom' (1912); 'Intimations of Immortality, in the Sonnets of Shakespeare' (1912); and also edited the 'Poems of Alice Freeman Palmer' (1915). He received the honorary degrees of Litt.D. Western Reserve, 1897; Princeton, 1912; LL.D. Michigan, 1894; Union, 1896; Harvard, 1906; Dartmouth, 1909.

PALMER, Herbert James, Canadian statesman: b. Charlottetown, Prince Edward Island, 1851. He received his education at Prince of Wales College, Charlottetown, and at King's College, Windsor, Nova Scotia, and in 1877 was called to the bar. He became a member of the Provincial Parliament in 1900 as a Liberal; was attorney-general in 1908; and for a few months in 1911 was Premier. In 1910 he was a delegate to the Conference on Representation of the Maritime Provinces in the Dominion Parliament, held at Saint John, New Brunswick.

PALMER, James Shedden, American naval officer: b. New Jersey, 1810; d. Saint Thomas, West Indies, 7 Dec. 1867. Entering the navy in 1825 as midshipman, he was made lieutenant in 1836. In the war with Mexico he commanded the *Flirt,* a blockade-schooner, in 1855 became commander, and when the Civil War broke out was with the Mediterranean squadron and in command of the *Iroquois.* Recalled from that station, he joined the blockading fleet under Admiral Dupont. In 1862 he was promoted to a captaincy, and in the passage of the batteries at Vicksburg held the advance of the Union vessels. At New Orleans and Mobile Bay he performed important services as flag-captain to Farragut, with whom his relations were most intimate. Made commander in 1863, he rose to the rank of rear-admiral in 1866, and until his death was in command of the North Atlantic squadron.

PALMER, John McAuley, American soldier and politician: b. Eagle Creek, Scott County, Ky., 13 Sept. 1817; d. Springfield, Ill., 25 Sept. 1900. He attended Shurtleff College, Upper Alton, Ill., for a year, and later studied law and was admitted to the Illinois bar in 1839. He first entered politics in the campaign of 1840, when he actively supported Van Buren; in 1843 he was elected probate judge of Macoupin County; in 1847 was a delegate to the State Constitutional Convention; and in 1849 was elected county judge. In 1852 he was elected to the State senate and re-elected in 1854. His opposition to the Kansas-Nebraska bill, however, led him to sever his connection with the Democrats, and ally himself with the Republican party. He was active in the organization of this party, was president of the Republican State Convention in 1856, and delegate to the National Convention of the same year and that of 1860. He was one of the representatives of his State at the Peace Conference in Washington 1861. At the outbreak of the Civil War he joined the army as colonel of an Illinois regiment, took part in the Springfield campaign, and in December 1861 was promoted brigadier-general; in 1862 he was made major-general, in 1863 given command of the 14th corps and later of the Department of Kentucky. He took part in the operations against Island No. 10 (1862), led a division at Murfreesboro (1862) and at Chickamauga (1863); as commander of the 14th corps he was engaged in the battles of Chattanooga (1863), Kenesaw Mountain and Peach Tree Creek (1864), and in the Atlanta campaign. After the war he continued his law practice in Illinois, and in 1868 was elected governor of the State; during his administration he steadily resisted special legislation and the granting of special privileges. In 1872 he left the Republican party and supported Greeley for the Presidency, and in 1876 was one of the most active supporters of Tilden. In 1890 he was nominated for United States senator by the Democrats, and elected, serving for six years. In 1896 he was nominated for the Presidency by the Gold Democrats, who refused to accept the regular nominations on account of the free silver plank of the platform. He wrote his autobiography, published under the title 'Personal Recollections of John M. Palmer.'

PALMER, John Williamson, American author: b. Baltimore, Md., 4 April 1825; d. there, 26 Feb. 1906. He was graduated from the University of Maryland as a physician in 1847; was city physician in Baltimore, 1849–50, and subsequently went to China and India as a surgeon in the service of the East India Company. He was connected with the staff of the Century and Standard dictionaries, and his care and accurate rendering of Hindu terms in those works has added much to the Western knowledge of Anglo-Indian terms. Among his publications are 'The Golden Dragon; or, Up and Down the Irrawaddi' (1853); 'The New and the Old; or, California and India in Romantic Aspects' (1859); 'After His Kind,' a novel (1886); 'The Poetry of Compliment and Courtship' (1867); 'For Charlie's Sake and Other Lyrics and Ballads' (1901); and 'Stonewall Jackson's Way,' one of the most popular ballads of the Civil War.

PALMER, Nathaniel Brown, American sea-captain: b. Stonington, Conn., 1799; d. 1877. He went to sea at 14 and in 1821 he commanded the sloop *Hero* which set sail from Yankee Harbor in South Shetlands on an exploring expedition. He discovered the land known as the Palmer Archipelago, which at the time was supposed to be a portion of the Antarctic continent. It is now called Palmer's Land, being located in lat. 63° S., near Tierra del Fuego. He followed a seafaring life until 1849 and was afterward a director of the Fall River line of steamships. Consult Greely, 'American Discoverers of the Antarctic Continent' (1912).

PALMER, Ray, American Congregational clergyman and hymnologist: b. Little Compton, R. I., 12 Nov. 1808; d. Newark, N. J., 29 March 1887. He was graduated at Yale in 1830; studied theology and entered the Congregational ministry. He was pastor of churches at Bath, Me., 1835–50, and Albany, N. Y., 1850–66; and secretary of the Congregational Union in New York City, 1866–78. He was the author of many sacred hymns, of which the best known is 'My Faith Looks Up to Thee,' included in very many collections of church hymns and translated into more than 20 languages. His published volumes are 'Hymns and Sacred Pieces' (1865); 'Hymns of My Holy Hours' (1868); 'Voices of Hope and Gladness' (1880).

PALMER, Samuel, English painter: b. Newington, Lancashire, 27 Jan. 1805; d. Reidgate, Kent, 24 May 1881. He was a pupil in the antique school of the British Museum, and received some inspiration from his acquaintance with William Blake. His studies were for two years continued at Rome (1837–39) after which he devoted himself to water colors and became a member of the Water Color Society in 1854. While belonging to the ideal school of Turner and Wilson he confined himself entirely to water color and etching, in both of which departments he reached the highest excellence. Among his best-known pictures which are suffused with profound poetic feeling are 'Dream on the Apennines' (1864); 'Curfew' (1870); and 'The Waters Murmuring' (1877). His finest etchings include 'The Sleeping Shepherd'; 'The Skylark'; 'The Lonely Tower.' He translated the Eclogues of Virgil and intended to illustrate them, but only lived long enough to complete one plate, 'The Opening of the Fold.'

PALMER, Thomas Witherell, American legislator: b. Detroit, Mich., 1830; d. 1913. He was educated at the University of Michigan and traveled extensively in Spain and in South America. He was engaged in real estate operations from 1853 to 1872. In 1873 he was elected to the Detroit board of estimate and five years later became a member of the State senate. He was unsuccessful Republican nominee for governor in 1880, but became United States senator in 1883. President Harrison sent Palmer as Minister to Spain in 1889 where he remained two years. Soon after his return he was elected president of the World's Columbian Commission.

PALMER, Walter Launt, landscape artist: b. Albany, N. Y., 1 Aug. 1854. After studying under F. S. Church at Hudson, N. Y., he became the pupil of Carolus Duran at Paris and developed great skill in landscape painting, specializing in winter landscapes. He was awarded a gold medal at the World's Columbian Exposition in 1893, honorable mention at the Paris Exposition of 1900 and subsequently received numerous other awards and honors. His Venetian scenes and snowy landscapes are remarkably effective and among his best productions are ‘Venice’ (1882); ‘January’ (1887); ‘Domes of La Salute’; ‘End of a Winter Day’; ‘Under the Pines’ (1896); ‘Sundown at Walpole, N. H.’ (Buffalo Academy 1901); ‘Oaks in Winter’ (1906); ‘The Glade’ (1913); ‘The Sleeping Brook’ (1914); ‘The Frozen Lake’ (1915). He is a member of the National Academy; of the Society of American Artists and the American Water-Color Society.

PALMER, in mediæval times a term applied to a pilgrim who had visited the Holy Land and carried on his return a branch of the palm for a staff as a memorial of his journey. The name was also given to itinerant monks or religious men who wandered from shrine to shrine without a fixed home.

PALMER, Mass., town, Hampden County, on the Chicopee, Swift and Ware rivers, and on the Boston and Albany and Central Vermont railroads, 14 miles east of Springfield. It includes the villages of Palmer, Three Rivers, Bondsville, Thorndike and Duckville, of which the first two are the most important. It was first settled in 1716 by John Kingston, and was incorporated as a town in 1775; for several years previous to its incorporation (1741–52) it was called Kingston. It is an enterprising industrial town and manufactures cotton and woolen goods, carpets, foundry and machine-shop products, wire, wire nails, hats, etc. It has a public and an association library and the Massachusetts Hospital for Epileptics. Pop. 8,610. Consult Temple, ‘History of the Town of Palmer, Mass.’ (Palmer 1889).

PALMERIN (păl'mėr-ĭn) **OF ENGLAND** (Palmerin de Inglaterra), a romance of chivalry in the style of ‘Amadis of Gaul,’ and in this class of literature regarded as second only to it in point of merit. It is this book, which with ‘Amadis,’ Cervantes saves from the holocaust in ‘Don Quixote.’ It was long supposed to be the work of Francisco Moraes, a Portuguese, who published it in 1567 as a translation from the French, and in 1807 Southey published an English translation, attributing the original to Moraes, and credited him with modesty in not claiming the authorship. It has since been found to have been the work of Leon Hurtado, and to have been published originally in Spanish, in Toledo, in 1547. This story is in some respects a continuation of ‘Palmerin de Oliva.’

PALMERIN DE OLIVA, päl-mä-rēn' dā ō-lē'vä, a romance of chivalry, a feeble imitation of ‘Amadis of Gaul,’ first published in Salamanca in 1511. It has generally been considered to be of Portuguese origin; but Ticknor, in his ‘History of Spanish Literature,’ asserts that the author of it was a carpenter's daughter in Burgos. This is one of the books against which Cervantês inveighs as responsible for the mental condition of Don Quixote; and in the famous scene of the burning of the books of chivalry, he says: "This Oliva, let it be hewn in pieces and burnt, and let not the very ashes be left." A continuation by the same author, ‘The Second Book of Palmerin,’ which treats of the adventures of his sons, Primaleon and Polendos, appeared later.

PALMERSTON, päm'ėr-stŏn, **Henry John Temple**, Viscount, English statesman: b. Romsey, Hampshire, 20 Oct. 1784; d. Brockett Hall, Hatfield, Hertfordshire, 18 Oct. 1865. He was educated at Edinburgh University and at Saint John's College, Cambridge, being graduated from the latter in 1806. He had succeeded in 1802 as 3d Viscount Palmerston in the Irish peerage, a title which did not disqualify him from sitting in the House of Commons. In 1806 and 1807 he was the Tory candidate for Parliament from Cambridge University, and was both times defeated, but in 1807 was elected to Parliament from Newton, Isle of Wight. In 1809 he succeeded Lord Castlereagh as Secretary at War, and in 1811 was elected member of Parliament for Cambridge University. As Secretary of War he carried out a vigorous reform of the details of administration; regulated the finances, paid off arrears and reduced the previous confusion of the War Office to order. He mainly confined himself in his Parliamentary speeches to the business of his department, but also spoke on Catholic Emancipation, of which he was always a supporter. He retired from office in the Wellington ministry in 1828 with others of the Canning party. In 1830 he became Foreign Secretary in the Whig ministry of Earl Grey, and from this time continued a member and leader of the Whig party. In 1831 he lost his seat for Cambridge, but was elected from Bletchingley, then from South Hants, and in 1835 from Tiverton, which borough he continued to represent till his death. It was during his service as Foreign Secretary that he earned a reputation for vigilance and energy in the conduct of foreign affairs, and especially for guarding the interests of individual Britons abroad, which, while it increased his popularity at home, gained him enemies abroad. He succeeded in establishing and maintaining friendly relations with France so that the two nations acted in concert; took a leading part in gaining the independence of Belgium, and in establishing constitutional government in Spain and Portugal. He supported Austria and Turkey against Russia, in the East, and took part in the war against Mehemet Ali. In Parliament he supported the liberal policy of free trade and labor laws regulating hours, factory conditions, etc. He was Foreign Secretary till 1841, when the Whig ministry went out of office on the question of free trade in corn, but on the Whigs' return to power in 1846 he again took that office, under Lord Russell. During the period of 1848–49 he manifested his liberal tendencies and sympathy with the revolutionary party without actively interfering with the affairs of foreign states. Several of his acts in this administration aroused party criticism, especially his favoring the cause of a Portuguese Jew at Athens, Don Pacifico, a naturalized British subject, which caused a quarrel with Greece and nearly produced a war with France. This was the occasion of a keen discussion of his policy in Parliament, which resulted in a formal vote in the House of Commons approving the foreign policy of the government. In 1851 he unofficially expressed to the French Ambassador in London his approbation of the *coup d'état* of Louis Napoleon, without consulting either his colleagues or the queen, and he was forced to resign. In the next year he defeated the Russell ministry on the question of the Militia bill, but refused to accept a position in the cabinet under Lord Derby. In December 1852 he took office as Home Secretary in the coalition ministry of the Earl of Aberdeen, and on the resignation of this ministry, in consequence of alleged mismanagement of the Crimean War, he was, on the almost universal demand of the country, called to the premiership, and vigorously carried on the war with Russia. In 1857 Parliament, on the motion of Richard Cobden, passed a vote of censure on the conduct of the Chinese War; dissolution of the House gave Palmerston a majority, but in February 1858, he resigned, after being defeated on the Conspiracy bill; he returned to power in June 1859, and continued to hold the premiership during the remainder of his life and at the time of his death had held office for nearly 50 years.

Among the important events of his last administration were the American Civil War (with the recognition of the Confederate States as belligerents and the *Alabama* incident), the Prussian War against Denmark, which he opposed, and the union of Italy, which he strongly favored. Consult the official 'Life' by Dalling, continued by Ashley (1870–76); 'Lives' by the Marquis Lorne (1891); Sanders (1888) and Trollope (1882) and Francis. 'Opinions and Policy of Viscount Palmerston' (1852).

PALMETTO. See PALMS.

PALMETTO STATE, a name applied to South Carolina. The palmetto tree appears on the coat of arms of the State. See SOUTH CAROLINA.

PALMIERI, pāl-myā'rē', **Aurelio,** Italian missionary and author: b. Savona, Italy, 4 May 1870. He was educated at the Seminary of Maria and the Augustinian Convent, Naples. In 1885 he entered the Augustinian Order, was sent to Constantinople in 1894 and was ordained in 1895. He was successively professor of theology and canon law and assistant pastor and missionary, Kadi-Keui, Constantinople. In 1905–07 he prosecuted Oriental studies in Rome and from 1907–10 was stationed at Cracow, Poland. He takes an active part in the biennial congress at Velehrad, Moravia, for the union of Christendom, and has traveled in Russia making a collection of Russian publications for the Vatican Library. His publications include 'Die Polenik des Islam' (1902); 'La chiesa russa' (1908); 'Vita di Dositeo, Patriarca di Gerusalemme' (1909); 'Il Progresso Dommatico' (1910); 'Nomenclator theologiæ græco-russicæ' (2 vols., 1910–11); 'Theologia dogmatica orthodoxa' (1911). Dr. Palmieri collaborated in 'Dictionnaire de théologie catholique,' 'Dictionnaire de biographie et d'histoire ecclésiastique,' and contributed to 'Oriens Christianus,' 'Civiltá Cattolica,' 'Studi religiosi,' *Rivista di apologia cristiana,* etc.

PALMIRA, pąl-mē'rą, Colombia, town and capital of Palmira province, department of Valle del Cauca, 160 miles southwest of Bogotá, situated in the Llanos de Malagana, a plain famous as a thriving agricultural region. Tobacco is grown extensively. The town dates from 1794. Pop. 24,312.

PALMISTRY, the art by which one professes to discover the temperament and character of any one, as well as the past and future events of his life, from an examination of the palm of his hand and of the lines traced upon it. As a considerable body of very complicated rules and directions have been laid down by authorities, ancient and modern, to enable the student to read the palm, palmistry claims to be regarded as a «science,» or at least as a branch of an interpretative science of the hand in general, to which the name *Chirosophy* has been given. The other branch of this general science has been called *Chirognomy,* and is concerned with the interpretation of the form and character of the hand and fingers, while palmistry treats of the palm only. The science was known to the early Chinese, to the ancient Greeks and was somewhat popular on the Continent during the Middle Ages. The chief authorities on palmistry in recent times are two Frenchmen, M. le Capitain D'Arpentigny and M. Adrien Desbarrolles; and it is on their works that modern English books on the subject are chiefly founded. The observation of the fingers and joints on the hand is quite as important to the palmist as that of the palm itself. The thumb is generally regarded as chirognomically the most important part of the hand. The first, or upper phalange of the thumb, when well developed, shows the presence of will and decision of character; the second, according to its development, indicates more or less logical power. What has to be considered by the chiromant proper is the «mounts» of the hand, with the marks on them, and the lines in the palm. The «mounts» are the elevations at the base of the fingers and thumb and in the «percussion» of the hand — that is, the side of the palm which extends from the root of the little finger to the wrist; it is so called because it is used in striking. They are seven in number and are named from the planets. See CHIROMANCY.

PALMITIN, PALMINE, or **TRI-PALMITIN,** a fatty substance occurring quite commonly in the natural fats and organic oils, and closely analogous to stearin in its chemical structure and deportment. It is especially abundant in palm oil, from which circumstance it derives its name. Tri-palmitin may be conveniently prepared from palm oil by expelling the liquid portion by pressure, washing the solid residue with boiling alcohol to remove such other fats as it may still retain, and finally crystallizing from a solution in ether. By this process it is obtained in the form of white crystals which are scarcely soluble in alcohol but readily soluble in ether, and which melt at 144° F. Varieties of tri-palmitin are said to exist, however, which melt at 115° F. Chemically, tri-palmitin is a compound of palmitic acid, $C_{15}H_{31}.COOH$, with glycerin, $C_3H_5(OH)_3$; three molecules of the acid being combined with one of the glycerin, as indicated by the equation $3C_{15}H_{31}.COOH + C_3H_5(OH)_3 = 3H_2O + C_3H_5(C_{15}H_{31}.COO)_3$, the last formula on the right-hand side of the equality sign being that of tri-palmitin. Two other compounds of palmitic acid with glycerin are also known, but they are of less importance. Mono-palmitin has the formula $C_3H_5(OH)_2(C_{15}H_{31}.COO)$, and melts at about 140° F. It may be distilled in a vacuum, but when heated in the air it breaks up with the formation of acroleïn and other products. Di-palmitin has the formula $C_3H_5(OH)(C_{15}H_{31}.COO)_2$, and its melting point is given, by various authorities, at from 125° F. to 140° F. When a mixture of glycerin and palmitic acid is heated for 24 hours at 400° F., all three of the palmitins are formed; and when the product is shaken with lime water, and then extracted with ether, and the ethereal solution is evaporated, tri-palmitin, di-palmitin and mono-palmitin separate out in the order named. The palmitins are readily saponified by heating with caustic alkalis, and free palmitic acid may be conveniently prepared by adding hydrochloric acid to an aqueous solution of potassium palmitate.

PALMS, trees or shrubs of the monocotyledonous family *Palmaceæ,* ranking in economic importance next to the grasses. The species, of which about 1,000 are recognized, belong to about 130 genera. The great majority of these genera consist of only a few species, in many cases of only one. *Calamus* (the rattan palms) is the largest genus, consisting of about 200 mostly Asiatic species with no representatives in the Western hemisphere. *Geonoma* and *Bactris,* American genera, each contain about 100 species. Another American genus, *Chamædorea,* has about 60 species. The Asiatic and Australasian genus, *Licuala,* contains about 30 species. *Cocos,* an American genus with the exception of the cocoanut, which is cosmopolitan within the tropics, also contains about 30 species. *Desmoncus* (American), *Pinanga* and *Areca* (Oriental) each contain about 25 species. Geologists and botanists are fairly well agreed that the palms represent a once more extensively distributed and more numerous group of plants and that they are now upon the decline. Fossil remains are preserved in the rocks of the Middle Cretaceous, and, in North America, in those of the Upper Cretaceous from Greenland southward; in both Europe and North America they are also found in the Tertiary rocks.

With few exceptions the individual genera and even the tribes which they comprise are restricted in their distribution; certain tribes are African, others Asiatic or American, etc., and certain genera are found in very small areas; for instance, *Pseudophœnix sargenti* is found only in certain of the Florida Keys and even there in limited numbers, and the species of *Howea* only in Lord Howe's Island, a tiny speck of land in the southern Pacific Ocean. Only one species (*Chamærops humilis*) is an acknowledged native of Europe. The most noted exception to this rule is the cocoanut palm (*Cocos nucifera*) which appears throughout the tropics upon maritime land. It is among the first plants to obtain a foothold upon newly-formed islands. As a group, the palms are almost restricted to tropical and subtropical countries; the European species mentioned, however, extends as far north as latitude 44°; an American species, the palmetto (*Sabal palmetto*), to 35°; some Asiatic species to 34°. In the Southern hemisphere some American species reach latitude 36° S., some African 30° S. In Australia, latitude 35° S. is the limit; but in New Zealand one species reaches 38° S. There are, however, a few South American species which approach the perpetual snow line upon the mountains. With respect to habitat, the various species exhibit a wide range of adaptability, some, like the cocoanut, growing upon the sea coast, others wholly inland; some in sand, others in rich alluvial soils; some in swamps, others on dry hillsides; some in exposed places, others in the depths of the forest; some solitary, some in groups, some in forests or jungles to the exclusion of other trees.

In general, palms are erect, unbranched trees with buttressed bases. They often attain heights of 100 feet and at the summits of the usually smooth or slightly ringed columns they bear a rosette of large leaves each of which resembles in some kinds a fan and in others a feather. In some species of the latter type the leaves may exceed 40 feet in length and six feet in breadth. There are, however, exceptions to the ordinary columnar habit of growth; a few species are branching; some are low growing, even creeping; others are slender stemmed plants which climb by means of hooked spines; some have flexible stems which extend from tree to tree in festoons and attain several hundred feet, 500 feet being common, and some writers placing the length at 1,500 and even more. In the ordinary species the flowers are borne in huge clusters which appear from within spathes that open in some cases with a report. The fruits are of various kinds, berries and drupes being perhaps most common. They are often enclosed in a fibrous husk, and frequently contain a hard nut. The flowers, which are generally small and individually inconspicuous, bear no relation in size to the fruit, which may be as small as a pea or, as in the double cocoanut, larger than a man's head.

While the grasses are of widest economic importance among plants the palms are employed for the largest number of purposes. All parts of the various species are used, but in few do more than two or three parts find extensive employment. Many palms furnish good fuel, some useful timber, others masts and spars. The pith of certain species, especially of *Metroxylon* and *Caryota* supplies sago. The thin, pliant stems of many species of *Calamus,* known commercially as rattan, are widely used throughout the world for wickerwork and furniture. The terminal bud of several kinds is cooked and eaten like cabbage, such species being known as «cabbage palms»— for instance, *Euterpe oleracea.* The leaves serve for thatching houses, and as material for walls, mats, screens, shields, clothing, hats, bedding, cordage, twine, nets, etc. The spines of certain species are used for tipping arrows and spears, for tattooing, for fish-hooks, etc. The fibre of the leaves of many species seems to offer useful paper-stock; that of others, for example, the piassaba fibre, derived from various species of *Attalea* (especially *A. funifera*) is extensively used for brushes of various kinds, ranging from hair-brushes to stable brooms and street-cleaning machines. The sap of several species is used for the manufacture of palm-wine and of arrack, the latter a spirituous liquor; it is also employed in making jaggery, a kind of sugar of some commercial importance.

For this latter purpose *Phœnix sylvestris* is perhaps the principal species. In some cases the sap is obtained by tapping; in others by cutting the terminal bud or even the trunk near the base.

The fruits of many species are useful. As food the cocoanut and the date are probably the most widely known and important. The former is employed not only as a fruit, but its contained liquid or "milk" furnishes a palatable drink either fresh or prepared as a wine. The kernel supplies the "shredded coconut" employed in confectionery, cakes and puddings. It also yields cocoanut butter or oil. The fibre of the husk is widely used for matting and is very popular where great durability is essential, as upon the aisles of public halls. The shells make serviceable dippers, bowls and other utensils, or when carved and polished, attractive ornaments. The date palm supplies the Arab and other peoples of northern Africa and southern Asia with one of their chief foods, for which purpose it is commonly seen near dwellings, besides being planted extensively for commercial purposes. The chief commercial supplies come from Arabia, Persia and Mediterranean Africa.

Oils are obtained from the fruits of a large number of species, especially *Elæis guineensis*. Some of these oils are used for food, others for lubricating; some for illuminating; and others for soap and candle making. Usually these oils are orange-colored, violet-scented and sweetish. They are generally obtained bv boiling the ripe fruits in water, though also frequently by expression. Like butter, they soon become rancid unless kept cold. Palm butter is a popular name for several of the kinds. A palm wax is secured from species of *Copernicia*, and is used like beeswax.

The seeds of many species are very hard and are used for manufacturing small ornamental and useful articles such as knife handles, collar buttons, etc. Probably the best known of these is the so-called "vegetable ivory" (q.v.) which is derived from the *Phytelephas macrocarpa*, a South American species with a short or even creeping stem, from which arise pinnate leaves often more than 15 feet long. The seeds of *Areca catechu* are mixed with lime and pepper leaves to make the notorious "betelnut" (see BETEL) of eastern Asia. The product is used as a stimulant.

The most remarkable palm of all is perhaps the palmyra, deleb or barossus palm (*Borassus flabellifer*). This species is a native of southern Asia, the Australasian Archipelago, and western Africa, where it sometimes exceeds 100 feet in height. The leaves, which often exceed three feet in length, have spiny-margined petioles; the triangular fruits are about five inches in diameter, have a brownish or black, glossy, succulent, fibrous rind, and contain three seeds about as large as goose-eggs. Throughout India this is the commonest palm, and in Ceylon it occurs in extensive forests. It is employed for more purposes than perhaps any other plant, upward of 800 uses being recorded for its various parts. Its wood, palmyra wood, is heavy, dark, hard, durable, easily polished, difficult to cut across the grain but easy to cut with the grain. It is used for house-building, furniture, etc. The wood of some other palms is also known by this name and as porcupine-wood. The leaf stalks make excellent fences. The leaves are employed for thatch, mats, umbrellas, fans, hats, baskets, as writing tablets, for ropes, twine, etc.; the down at the leaf-bases for lint and for filtering liquids; the sap yields sugar, palm wine and arrack; the fruit is cooked as an esculent; the young seeds are similarly employed, and the young plants serve as pot-herbs. A large part of the population of southern India depends upon this plant to supply its needs — fuel, shelter, clothing, food, etc.

Among the most important palms the following with their chief uses may be mentioned: Assai or Para palm (*Euterpe edulis*), a South American species whose fruits are macerated in water to make a popular drink called assai; Bourbon palm, one of the most widely grown of greenhouse and house palms, usually called *Latania borbonica* by florists, but properly *Latania commersonii:* double Seychelles, or sea-cocoanut palm (*Lodoicea callipyge*), chiefly noted for its great size, slow growth, enormous seeds weighing more than 10 pounds (even, it is said, more than 30 pounds), which from their seeming malformation but more particularly from their formerly unknown origin, gave rise to numerous fabulous tales; curly palm (*Howea belmoriana*), one of the best-known greenhouse palms, and popularly called *Kentia belmoriana;* fan-palm, any species with fan-like leaves; fern-palm (*Cycas revoluta*, etc.), commonly raised in greenhouses; fish-tail, wine or toddy palm (*Caryota urens*), a source of jaggery, arrack and palm wine; flat palm (*Howea fosteriana*), a favorite greenhouse palm popularly known as *Kentia fosteriana;* raphia palm (*Raphia*), which furnishes the raphia used by florists and nurserymen for tying up plants; Royal palm (*Oreodoxa regia*), so named in expression of its majestic appearance, and one of the most popular avenue-palms of warm countries; umbrella palm (*Hedyscope canterburiana*); walking-stick palm (*Bacularia monostachya*); wine palm (*Caryota urens; Phœnix sylvestris; Borassus flabelliformis*, and *Cocos butyracea*); gomuto or areng palm (*Arenga saccharifera*), which furnishes fibre used for cordage, canvas, etc., and sugar, wine, vinegar, etc.; inaja palm (*Maximiliana regia*), the spathes of which are used as baskets and as cooking utensils; doum palm (*Hyphæna thebaica*), one of the few branching palms; talipot palm (*Corypha umbraculifera*), noted for its prodigious fertility in flowers, the number of blossoms upon a single tree having been estimated at 60,000,000, the inflorescence attaining a height of 30 feet above the crown of leaves. The "palm" of the Bible is believed to be the date-palm, which is one of the commonest species in Syria at the present time. The so-called Panama-hat palm (*Carludovica palmata*) is not a palm botanically, but a member of the family *Cyclanthaceæ*.

With the exception of the date and the cocoanut, palms are little cultivated, the wild species being relied upon for commercial purposes. Even these species and those used for sugar, arrack, etc., are usually planted in favorable situations and allowed to shift for themselves after once becoming established or even before. For ornamental purposes, however, more or less care is given the young trees used in warm climates for bordering avenues, and as lawn or garden specimens.

During the closing decade of the 19th century palms sprang into popularity as greenhouse and house plants, for which purposes, and for decorating halls, churches, hotels, lobbies, etc., about a dozen species have become deservedly popular, not only because of their graceful appearance, but because of their ease of cultivation. Many other species are also found in private conservatories. In the United States the chief centre of palm production for these purposes is the Middle Western States, but the South is also increasing its area devoted to ornamental palms. The plants are nearly all grown from imported seeds sown in warm greenhouses. In some cases the seeds require months or even more than a year to germinate; but usually a month or two is sufficient. In many cases the young seedlings resemble one another, whether they will develop into pinnate-leaved or fan-leaved specimens. At all times ample water and good drainage are essential; shading is also generally beneficial. The plants generally succeed best in well-rotted sod obtained from rather light soil rich in humus. Scale-insects and the red spider are the chief enemies; the former may be controlled with kerosene emulsion (see FUNGICIDE); the latter by forcible spraying, moist atmosphere and by evaporated (not burned) sulphur. The fumes of burning sulphur are fatal to the plants.

Consult Bailey, 'Standard Cyclopedia of Horticulture' (New York 1900–02); Martius, 'Historia Naturalis Palmarum' (Munich, 1823–50); Kerchove de Denterghem, 'Les Palmiers' (Paris 1878).

M. G. KAINS,
Crop Expert.

PALMYRA, păl-mī'rạ, Asiatic Turkey, the Hebrew *Tadmor,* City of Palms, an ancient city of Syria, now in ruins, 140 miles east-northeast of Damascus, lat. 34° 24′ N., long. 38° 20′ E. It was founded or enlarged by Solomon in the 10th century B.C. It is situated in an oasis of the Syrian Desert, with a ridge of hills to the west and an extensive plain on the east. It is said to have been a bulwark of the kingdom of Israel against the wandering tribes of the desert, and was an entrepôt for the trade between Damascus and the Mediterranean, from which it drew considerable wealth. Palmyra was little heard of in history until the time of the Roman Empire. It is mentioned as having been attacked by Mark Antony, who hoped to find in it the means to pay his troops; but the Palmyrians transported their goods beyond the Euphrates, and he was compelled to leave without accomplishing his object. During the earlier period of the empire it was independent, and carried on a considerable trade with Persia, India and the Mediterranean. Subsequently, about 130, or according to other authorities later, it submitted to Rome, and became a Roman colony. The protection of Rome against its neighbors, the Parthians and the Persians, was of value, while the yoke of so distant a mistress was not heavy. It became the faithful ally of Rome in her wars against the Eastern powers. During the reign of Gallienus (260–68), Odenathus, the ruler of Palmyra, rendered such effectual assistance against the Persians that that emperor gave him the title of Augustus and recognized him as his colleague. Odenathus was succeeded by his widow, Zenobia, to whom Palmyra chiefly owes its fame, and who took the title of Queen of the East. She was besieged in Palmyra by Aurelian and compelled to surrender. On his departure the Palmyrians revolted, on which Aurelian returned and destroyed the city (273 A.D.). He permitted the inhabitants to rebuild it, but it never recovered its importance. The remains of Palmyra are chiefly of the Corinthian order, with the exception of the temple of the Sun, which is Ionic. They are supposed to belong to the period of Odenathus and Zenobia. (See ZENOBIA). Consult Wright, 'An Account of Palmyra and Zenobia' (1895).

PALMYRA, Mo., city, county-seat of Marion County, on branches of the Chicago, Burlington and Quincy Railroad, about 14 miles northwest of Hannibal and five miles west of the Mississippi River. It was settled in 1818, laid out in 1819 and incorporated in 1855. It is in a farming country and the chief manufactures are connected with farm products. It has a pickle factory, creamery, flour and grist mill and a carriage factory. The educational institutions are Centenary High School (M. E. South), founded in 1884, and the Saint Paul's College (P. E.), founded in 1848 as the Ingleside Female College, and public and parish schools. Pop. 2,168.

PALMYRA FIBRE. See FIBRE.

PALMYRA WOOD. See PALMS.

PALNI (päl'nē) **HILLS,** mountain range of southern India, joining the Eastern and Western Ghats, in the district of Madura, Madras presidency. The soil is fairly fertile and affords excellent pasturage. The climate is equable, comparatively dry and healthy, and there is a sanatorium at Kodikanal, 47 miles northeast of Madura.

PALO, pä'lō, Philippines, a pueblo of the island of Leyte, situated on the northeast coast at the mouth of the Malo Malo River, six miles south of Tacloban. It is an important road centre, being connected by road with Tacloban and other important towns to the south and west. Pop. 17,740.

PALO ALTO, pä'lō äl'tō, Cal., town in Santa Clara County, on the coast division of the Southern Pacific Railroad, 33 miles southeast of San Francisco and 18 miles northwest of San José. It was settled in 1891 by the opening of the Leland Stanford Jr. University (q.v.) which is located here. In 1892 a number of people established homes in Palo Alto on account of the university. It was incorporated in 1894. Palo Alto is a 'university town,» with but few industrial establishments. The planing mills have about 30 employees, and there are stores sufficient to supply a limited amount of the local needs. There are eight churches, a high school, elementary graded schools, Manzanita Hall, a preparatory school for boys and two preparatory schools for girls. The one bank has a capital of $100,000. The town is governed by a board of five trustees. The town owns the water and electric-light plants and has a good sewerage system. Pop. about 5,000.

PALO ALTO, Tex., the name of a plain, or field, eight miles northeast of Brownsville (q.v.), Cameron County, where was fought, 8 May 1846, the first important battle of the war between the United States and Mexico. General Taylor with 2,000 United States troops was on the Rio Grande opposite Matamoras; and General Arista with a force of 6,000 Mexicans tried to cut him off from Point Isabel which was the base of United States supplies. Taylor attacked and defeated Arista; the Mexicans retreated to Resaca de la Palma. The United States loss was nine killed and 44 wounded, two missing; the Mexicans, 102 killed and 128 wounded. Consult Howard, 'General Taylor' (1892); Bancroft, 'History of Mexico,' (Vol. V).

PALOLO, an annelid (of the genus *Eunice viridis*) found in great abundance in the sea near the coral reefs of tropical islands. They are taken in large numbers in autumn in nets by the islanders, who esteem them, when roasted, as a great delicacy. The body, about a foot long on the average, tapers toward both ends, and along each side are tufts of gills. An American species (*E. fucata*) abounds in various parts of the West Indies and Gulf of Mexico, but is not eaten.

These worms are interesting mainly on account of their extraordinary breeding habits. During the most of the year the worms lie coiled up in burrows in rotten coral-rock, or other friable material. When the eggs have ripened within the body, and the time for their discharge has come (which happens in early November in the south Pacific, and in July in the West Indies), the hinder part of the worm, which contains the ovaries and sexual organs, creeps backward out of the burrow, and struggles to get away, while the forward vital part holds on to its burrow. This takes place simultaneously with all the millions of worms in a district. After a little struggle the posterior part breaks away and swims with great rapidity to the surface, vast swarms rushing together to the top, where they are devoured by fishes and birds, and in the South Seas are netted by men, women and children, by the thousand. Almost at once each worm bursts, discharging the eggs in a shower, and when all are gone the worm ceases its backward flight, collapses and dies. On no other occasion is the worm seen to leave its submarine burrow.

PALOS, pä-lōs', Spain, a former important seaport town of Andalusia, in the province and 10 miles southeast of Huelva, on the left bank of the Rio Tinto, near the Gulf of Cadiz, where Columbus fitted out his ships, and whence he sailed on his first voyage for the discovery of the New World in 1492. The convent at the gate of which Columbus appeared as a poor stranger, and asked bread and water for his child, is still standing here. Palos is now an unimportant village.

PALPI, the organs or appendages, consisting of stalked or jointed processes, found in connection with the mouth of many invertebrate animals, and which appear to be chiefly devoted to the exercise of the sense of touch, the means by which the animal explores the surface upon which it walks, and probably in some cases of taste also. Thus, in many insects palpi are borne by the "maxillæ" or lesser pair of jaws (*maxillary palpi*), and by the "labium" or lower lip (*labial palpi*). The labial palpi in butterflies form the cushion-like organs by which the elongated proboscis or tongue is protected when at rest; and the small maxillary palpi of these insects are sometimes known as *palpuli*. In bees, etc., the labial palpi are of great relative length. In *Arachnida* (spiders, scorpions, mites, etc.) the maxillary palpi are largely developed. In the spiders these organs in the males are concerned in reproduction, and in the females they are terminated by hooked claws. In the scorpion the same structure forms powerful nipping-claws or *chelæ*. In the higher crustaceans (lobsters, crabs, etc.) certain of the jaws bear palpi. Consult Packard, 'Zoology' (1897).

PALPITATION, abnormal movement or beating of the heart, sometimes violent and spasmodic; sensible to the patient and causing discomfort or distress. Its immediate mechanics is an over-stimulation of the excitability of the muscular structures of the heart, due to disturbed action of the nerve structures which regulate its movements. The predisposing and exciting causes of palpitation are numerous; for example, an excitable temperament; bodily and mental exhaustion; inanition; deterioration of the blood as in scurvy, chlorosis and spanæmia; violent exercise or emotion; mental shock; dissipation; dyspepsia. Tobacco and alcohol by their poisonous action also cause palpitation. Disorders of the sexual apparatus in women is frequently accompanied by palpitation, which is common in youth and middle life, especially among those engaged in sedentary occupations. In short, whatever tends to disturb the orderly action of the nervous system may induce palpitation, which is sometimes accompanied by symptoms of choking (*globus hystericus*), vertigo, ringing in the ears, impaired vision, partial unconsciousness, a clammy coldness of the extremities and the fear of death, due to general nervous agitation. When palpitation arises from actual or organic disease of the heart it is sometimes spoken of as symptomatic; when due merely to disturbed action of the heart or to disorders elsewhere it is frequently called functional, though it is always but a symptom. When occurring with organic disease it often causes more anxiety to the patient than the disease itself. The heart's action is constantly being balanced by the two nervous systems, the sympathetic, overaction of which causes increase in its rate of contraction; and the autonomic, overaction of which causes a slowing. Thus an over sympathetic stimulation — as occurs in many hyperthyroid states for example — or an under autonomic action, as in any paresis of the vagus, will cause a tachycardia. In treatment, remove as far as possible the exciting cause, enjoin absolute rest, keep the feet warm, sometimes give hot drinks — milk, cocoa and hot water containing a little baking-soda are useful. Valerian and aromatic spirits of ammonia are often valuable. Severe cases should be under the care of a physician. Consult Bayliss, 'General Physiology'; Higier, 'Vegetative Nervous System' (in *Nervous and Mental Disease Monograph Series*).

PALSY. See PARALYSIS.

PALTSITS, pal'sits, **Victor Hugo,** American historian: b. New York, 12 July 1867. He was educated in public and private schools, Cooper Union and Columbia University. From 1888 to 1907 he was connected with the Lenox Library, New York, was State historian from 1907 to 1911 and since 1914 has been keeper of manuscripts at the New York Public Library, where since 1915 he also has had charge of exhibitions and since 1916 has held in addition the post of chief of the division of American history. Mr. Paltsits has edited several volumes of documents and has written ‘Bibliography of the Works of Philip Freneau’ (1903); ‘Bibliography of the Works of Father Louis Hennepin’ (1903); ‘Lewis and Clark Bibliography for Original Journals of Lewis and Clark’ (1904); ‘Bibliography of the Writings of Baron Lahontan’ (1905); ‘Scheme for the Conquest of Canada in 1746’ (1905); ‘The Almanacs of Roger Sherman, 1750–61’ (1907); ‘The Manuscript Division of the New York Public Library’ (1915).

PALUDAMENTUM, a white cloak, which the commander of the Roman army put on in time of war. Sometimes, however, the color may have been crimson, and in the case of the emperor himself it was purple.

PALUDAN-MÜLLER, pāl'oo-dān-mül'lĕr, **Frederik,** Danish poet; b. Kjerteminde, on the island of Funen, 7 Feb. 1809; d. Copenhagen, 29 Dec. 1876. In 1828 he entered the University of Copenhagen and while a law-student there attracted attention by his poem ‘Raab til Polen’ (1831) and a drama ‘Kjarlighed ved Hoffet’ (‘Love at Court’) (1832). His first poem of note was ‘Dandserinden’ (1833), followed in 1834 by the lyric drama ‘Amor og Psyche’ and by two volumes of ‘Poesier’ (1836–38). His later works include ‘Venus’ (1841, a dramatic poem); ‘Dryadens Bryllup’ (1844); ‘Tithon’ (1844); ‘Tre Digte’ (1854), among them the lyric drama based on the life of the Indian sage ‘Kalanus’; ‘Nye Digte’ (1861); and the two prose works, ‘Ungdomskilden’ (‘The Fountain of Youth’) (1865); and ‘Ivar Lykkes Historie’ (1866–73), a novel. His chief work is ‘Adam Homo,’ a poem in *ottava rima.* An edition of his poems in eight volumes appeared in 1878–79. See Adam Homo.

PALUDISM (Lat. *palus, palud-,* a marsh), malarial poisoning; disease or disposition arising from malaria (q.v.).

PAMBAN-MANCHE, or **SERPENT BOAT,** the native name for a long canoe used on the Malabar coast. They are from 30 to 60 feet in length, not more than three feet in beam and are hollowed out of a single tree. The largest are rowed by about 20 men, double-banked, and can attain a speed of 12 miles an hour.

PAMELA, pą-mē'lą, or **VIRTUE REWARDED,** a novel by Samuel Richardson, published 1741–42. It was the first work of its author, who began what is called the modern analytic novel. It won instant applause and a wide circle of readers, all classes of society following with close attention the shifting fortunes of Pamela Andrews, a serving-maid whom the son and heir of the family dishonorably pursues. Richardson created a new era in fiction when he chose a girl of the humble class for heroine, and made use of every-day contemporaneous persons and scenes of the purposes of the novelist. Thus the story of incident and the analysis of character came into English fiction, and thus the modern novel traces its development from Richardson. It was satirized and parodied in ‘Joseph Andrews’ by Fielding.

PAMIR (pā-mēr') **PLATEAU, The,** or **THE PAMIRS,** West-Central Asia, an elevated region described as a «huge boss or knot,» north of the Hindu-Kush Mountains, connecting the Himalyan and Thian-Shan mountain systems. (See Himalaya). The plateau is about 150 miles long by 150 miles broad, nine-tenths of the area being mountainous and the rest pasture-land. The name applied to the valleys is derived from the Persian *pai* and *mir,* signifying «the foot of mountain peaks»; the region is called also by the Persians *Bām-i-dunyā* («the roof of the world»). The territories belonging to Russia, China, Afghanistan and Britain meet in the Pamir region, and until the completion of the Anglo-Russian surveys in 1895 demonstrated its strategic valuelessness, owing to climate and physical conditions, it was a fertile source of political dispute. The plateau has a general elevation of more than 13,000 feet, dominated by still loftier ridges and summits attaining a maximum altitude of 25,800 feet in Mustagh-ata, in the Sarikol range, and covered with perpetual snow. On the plateau are several small lakes, and the sources of the Oxus. From November to April the Pamirs are snow-bound and practically inaccessible, while in the spring and summer the high winds make traveling very unpleasant. The great part of the surface is bare and barren; the native Kirghiz, however, find a certain amount of pasture for their cattle in summer, and in favored localities there is some cultivation. The «roof of the world» is celebrated throughout central Asia, and notwithstanding its physical drawbacks, two recognized trade routes have traversed it east to west for ages.

PAMLICO, păm-lē'kō, a so-called river in North Carolina, really an estuary of Tar River, opening into Pamlico Sound. It is 40 miles long, from one to eight miles wide and navigable for steamers which can enter the sound. Several small streams flow into the Pamlico River.

PAMLICO, a sound or lagoon on the coast of North Carolina, the largest lagoon on the east coast of the United States. It is about 80 miles long and from 15 to 30 miles wide. It is separated from the Atlantic Ocean by long, narrow, sandy islands — bars or beaches — the point farthest out being the famous Cape Hatteras. Pamlico and Neuse rivers or estuaries enter the sound, and the outlets on the east are Hatteras and Ocracoke inlets. The northern part is shallow, connecting through Crotian Sound with Albermarle Sound; the central and southern area has a depth of 21 feet or more. Fish, oysters and wild fowl are abundant. Several small islands skirt the shore; Roanoke, at the northern extremity of the sound, is the largest.

PAMLICO INDIANS, a former American tribe living on the Pamlico River in Beaufort County, N. C. They were greatly reduced in number by the smallpox in 1697, and were practically exterminated by the Tuscarora War in 1711.

PAMPA, pām'pā, or **BAMBA,** a Quichua word meaning «plain,» applied to various great plains in South America, and also occurring in proper names, for example, Riobamba, Moyobamba, Ayapampa («Plain of Death»), and

Cochabamba («Lake Plain»). Rarely, as in Peru along the Ucayali River, forested plains are spoken of as pampas; the typical pampas are stretches of treeless plain, varied with rolling prairie, their vegetation being annual or perennial herbaceous plants, with a few shrubs. Water courses are absent, but there are many lakes or pools of rather brackish water. The predominance of grasses, especially varieties of the cereals, make the pampas in general an ideal feeding ground for steers, horses and sheep. A marked botanical feature of the pampas is a huge thistle apparently indigenous to the Northern hemisphere.

In common usage pampa or the pampas is confined to a great plain in Argentina, the administrative district of Pampa Central, with General Acha as capital. Here to a certain degree the original nature of the vegetation has been altered by tree planting, so that much of the plain, which many years ago was opened up for cattle grazing by Roca's successful expedition against the Indians of this region, now no longer grows the pasto amargo, but only grasses better suited for sheep. These are tended by Gauchos, Spanish and Indian half-breeds. The pampas have been scientifically studied by d'Orbigny, Darwin and Roth. Beneath a layer of thin vegetable mold, there is 40 or 50 yards of reddish clay, with an admixture of fine sand of chalky infiltrations, apparently proving repeated inundations in geological time. There is a rich prehistoric fauna, notably remains of machærodus, hippidimus, mylodon, megatherium and mastodons; in the whitish lacustrine deposits near the surface fragments of terra-cotta and primitive tools, as well as bones (some of prehistoric animals), engraved and polished by man.

PAMPA AULLAGAS, owl-yä'gäs, or **POOPO.** See AULLAGAS.

PAMPANGA, päm-pän'gä, Philippines, a province of the island of Luzon, situated in the southwestern part of the island, bounded on the north by Tárlac, on the east by Bulacán, on the south by the Bay of Manila and on the west by Zambales; length, 37½ miles from north to south; greatest width, 34 miles; area, 2,209 square miles. The province is high in the north and mountainous in the northwest and west but low and marshy in the south; along the shore of Manila Bay and for several miles inland the country is covered by canals and the estuaries of the Grande de la Pampanga River. The principal products are rice (raised in the lowlands of the south), sugar, sweet potatoes, gabe, tobacco and cotton. Agriculture is the chief occupation of the inhabitants, but mechanical industries are also quite extensively developed; the most important are weaving and the manufacture of sugar, the fisheries of Pampanga are increasing in importance, and there is a large local trade in nipa, sugar, honey, sacks, etc. There are roads connecting all the towns, and connecting the province with Manila, Cavité, Tárlac and Nueva Ecija; the Manila and Dagupan Railroad crosses the province from southeast to northwest, passing through the larger towns, and has been an important factor in the industrial development of the province. The great majority of the people are Pampangos (q.v.). Civil government was established in the province in February 1901. Pop. 224,000.

PAMPANGA, Rio Grande de la, rē'ō grän'dā dā lä päm-pän'gä, one of the four great rivers of Luzon, Philippines, is formed in the northern part of Nueva Ecija by the junction of a number of streams that drain the western slopes of the Caraballos Sur, flows southwest and south through the province of Nueva Ecija and Pampanga and empties into Manila Bay through a delta of eight mouths. It drains a large territory, and has numerous tributaries, chief among them the Rio Chico de la Pampanga; in the rainy season it overflows its banks in the lower part of its course, and these inundations make fertile soil for the cultivation of rice. It is about 120 miles long, and the means of a large local trade.

PAMPANGOS, a group of tribes of the Philippine Islands inhabiting the province of Pampanga, Luzon and single localities in Nueva Ecija, Bataán and Zambales. They are of the Malay race, and at the time of the Spanish conquest of the islands had a civilization and writing of their own. In Pampanga they use their own langauge, which is spoken exclusively in that province.

PAMPAS, păm'pąz (Sp. päm'päs). See PAMPA.

PAMPAS CAT. The grass, straw or wildcat (*Felis pajero*) of South America, common on the grassy plains. Hudson, in 'A Naturalist in La Plata' (1892), describes it as not unlike the European wildcat in its robust form and dark color, «but a longer, more powerful animal, inexpressibly savage in disposition.»

PAMPAS DEER, a small deer (*Cervus campestris*) of the plains of southern South America, having antlers of three points each.

PAMPAS GRASS, the most beautiful and the most important commercial ornamental grass (*Cortaderia argentea*). It is a native not of the pampas of South America, but of the well-watered higher lands of Brazil and Argentina. It grows in large clumps, has leaves often more than six feet long, and flowering stems frequently exceeding 10 feet in height, surmounted by great graceful plumes (panicles) of silvery-white flowers which may be more than two feet long. This beautiful plant is grown in large quantities in California and sold for use in decoration, the plumes often being dyed with aniline in various tints. Outside of California, which is the only country where this grass is grown for market, the plants are cultivated for ornament in parks and gardens, but in the north they need protection with leaves or litter during the winter. They will grow in any good garden soil with no special attention. There are several horticultural varieties whose flowers are pink, carmine, purple and intermediate tints. Two related species are of some importance; uva grass (*C. saccharoides*), a native of Brazil, furnishes considerable sugar, and *C. jubata*, a plant even more graceful than the pampas grass. Neither is grown in the United States, the former being very tender and the latter little known.

PAMPAS DEL SACRAMENTO, päm'päs dĕl säk-rä-mĕn'tō, Peru, great plain in the northeastern part of the republic, between the Ucuyali and Aullaga (or Huallaga) rivers; area, 60,000 square miles. It is crossed by excellent waterways, has a rich vegetation and was settled in the 18th century by Jesuit missionaries, but is now almost deserted.

PAMPELUNA, päm-pā-loo'nä, or **PAMPELUNE**, päṅp-lün, variant spellings of Pamplona (q.v.).

PAMPHILUS, păm'fĭ-lŭs, Greek painter: b. between 390 and 350 B.C. He and Eupompus were the founders of the Sicyonian school of painting. He was the teacher of Apelles and Melanthus and was famous for scientific accuracy in drawing and perspective. He made his pupils pay him a talent (about $2,000) for a course in painting. Among his works famous in antiquity were 'The Battle of Phlius'; 'The Voyage of Ulysses' and 'Family Group.'

PAMPHILUS, Saint, a priest of Cæsarea, by birth a Phœnician, who for refusing to sacrifice to idols was cast into prison. He was a theological teacher at the famous catechetical school at Alexandria and collaborated with Eusebius in writing 'The Apology for Origen.' Persisting in adherence to the Christian faith, he was condemned to death (309) and suffered martyrdom by decapitation 16 February, the day on which his festival is celebrated.

PAMPHLET, a name applied to an ephemeral publication, occasional and not periodical, commonly discussing some question of public or special interest at the time. There are thus two distinct classes of pamphlets, the one addressed to the general public, and discussing some question of immediate though probably of temporary interest. Political pamphlets form the type of this class. The other is addressed to a special class of readers, and discusses something connected with their particular interests or pursuits. Pamphlets of both classes are now to a great extent superseded by the opportunities of discussion afforded by regular periodical literature. They still, however, serve many important uses. Pamphlets have at various times since the introduction of printing exercised a very important influence, especially in this country, and in general in all times of political and religious excitement pamphleteers have been both numerous and vehement. They have comprised all sorts of men from scholars and men of genius to the most vulgar and venal of partisans.

PAMPHYLIA, păm-fĭl'ĭ-ạ, ancient division of Asia Minor, bounded on the north by Pisidia, on the east by Cilicia, on the south by the Mediterranean (Gulf of Adalia) and on the west by Lycia. Its coast line measured 75 miles, and its extent north and south was about 30 miles. The geological formation is peculiar, the entire surface of the country having been greatly changed since classical times by continuous fluviatile deposits of carbonate of lime. The region was never an independent kingdom, so far as we know, but was successively subject to Lydia, Persia, Macedonia, Pergamum and Rome. The population in early times seems to have consisted of an admixture of Semitic and Indo-Germanic elements. There were Greek settlements at Perge, Aspendus, Side, Cibyra and Attalia, and remains of Pamphylian inscriptions show that the dialect of Greek used there resembled both Cyprian and Arcadian and hence was a very early form. Consult Ramsay, 'Historical Geography of Asia Minor' (1890); Radet, 'Les villes de la Pamphylie' (1890, in *Revue Archéologique*); and Lanckoronski, 'Städte Pamphyliens und Pisidiens' (1890).

PAMPLONA, păm-plō'nä, **PAMPELUNA**, or **PAMPELUNE**, Spain, capital city of the province of Navarre, situated near the French border, 200 miles northeast of Madrid, in a plateau 1,400 feet above sea-level, on the right bank of the Arga River and on the railway from San Sebastian to Saragossa. There is an old and a new quarter. The former with its narrow streets has changed little since the city was the capital of the French kingdom of Navarre; but the new part is regularly laid out. The main objects of interest are a cathedral, begun by Charles III in 1397, the historic hall where the Cortes of Navarre used to meet, the churches of San Nicolas and San Saturnino and several fine promenades and boulevards, La Taconera being the best; nearby are the gorges of Mayo and Roncevalles. A citadel built by Philip II has been reinforced by more modern fortifications; the city is an important point strategically. The main industries are the manufacture of leather, linens, paper, flour, soap, strings for musical instruments and wines. There is a great market at Pamplona from 29 June to 18 July. The city may have been a Roman colony, Pompeiopolis, but the derivation is not certain. It was taken from the Arabs by Charlemagne in 778, passed to Ferdinand of Aragon in 1512, was held by the French during the Peninsular War and figured in the Carlist insurrections. Pop. 30,000.

PAMUNKEY, pạ-mŭnk'ĭ, a river in Virginia, formed by the junction of the North and South Anna. It joins the Mattapony at West Point and forms the York River. From the source of the South Anna to the York is 100 miles. The Pamunkey Indians have a reservation on the Pamunkey River.

PAMUNKEY, pạ-mŭnk'ĭ, and **TOTOPOTOMOY**, two streams in Virginia, the banks of which were the scenes of military operations during the Civil War. When General Grant withdrew from the North Anna (q.v.) on the night of 26 May 1864, he moved rapidly by the left to cross the Pamunkey, about 33 miles east. General Sheridan, with Torbert's and Gregg's cavalry divisions, preceded the infantry in the afternoon and at nine o'clock next morning had crossed the Pamunkey and occupied Hanover Town, near which place, on the Hanover Court House road, one of Gen. W. H. F. Lee's cavalry brigades was met and forced back toward Hanover Court House. On the morning of the 28th Gregg's cavalry division, advancing on the Mechanicsville road, had a severe engagement with the Confederate cavalry near Hawes' Shop (q.v.) and, aided by Custer's brigade, drove it back upon the infantry at the Totopotomoy. General Lee had early information of Grant's movements, and on the 27th put his army in motion to interpose between him and Richmond. Early's corps crossed the South Anna, and by midday of the 28th was in position with its right near Beaver Dam Creek, its left on the Totopotomoy, near Pole Green Church, four miles from Hawes' Shop. Anderson's corps formed on Early's right and covered the road from White House, on the Pamunkey, by Old Church, Bethesda

Church and Mechanicsville to Richmond. Hill's corps and Breckenridge's command extended on Early's left to near Atlee's Station, crossing the Virginia Central Railroad a mile north. On the afternoon of the 28th the Sixth and Second Union corps crossed the Pamunkey at Huntley's, four miles above Hanover Town, and took position across the Hanover Court House road at Crump's Creek, and the Fifth corps crossed at Hanover Town, the left near the Totopotomoy, an affluent of the Pamunkey, which it entered two miles below Hanover Town. The Ninth corps crossed at midnight. The Second, Fifth and Sixth corps formed a line in front of Hanover Town, 17 miles from Richmond, the Sixth on the right, the Second in the centre and Fifth on the left. At noon of the 29th Barlow's division of the Second corps advanced on the road from Hawes' Shop to Atlee's Station, small bodies of Confederate cavalry falling back before it to the other side of the Totopotomoy, where the infantry was found strongly entrenched. Warren's Fifth corps took position on the Shady Grove Church road, skirmishing with the enemy. Wright's Sixth corps moved on the right of the Second, occupying for a time Hanover Court House, and then closing in to the left, and the Ninth corps moved between the Second and Fifth, pushing out on the road to the Pole Green Church. There was incessant skirmishing during the 30th in an effort to develop the Confederate position, and late in the day Early's corps attacked Warren's Fifth corps near Bethesda Church and attempted to turn its left, but was repulsed. To relieve the pressure on Warren, Hancock at seven P.M. was ordered to attack, and Brooke's brigade carried the first line of rifle pits occupied by the Confederates. On the 31st Birney's division crossed the Totopotomoy and carried the enemy's advanced line on the right of the Richmond road. General Wilson's cavalry division moved to Hanover Junction and destroyed the railroad bridge over the North Anna, at the same time defeating the Confederate cavalry and driving it from Mechump's Creek; and Sheridan with two divisions of cavalry, was sent to occupy Cold Harbor, driving the enemy out, and was directed to maintain his position at all hazards. On 1 June Warren moved out to develop the Confederate position and found it intrenched strongly in his front, beyond clear ground, swept by artillery fire. He lost 200 killed and wounded, extended his line some distance to the left and was attacked in several places during the day and quite severely on the right just before dark. Everywhere General Grant had found General Lee confronting him in strong works, and determined again to retire from his direct advance toward Richmond and to throw his troops rapidly to the left to Cold Harbor (q.v.). This movement began on the night of 31 May, the corps moving successively from the right. Consult 'Official Records' (Vol. XXXVI); Humphrey, 'The Virginia Campaign of 1864–65'; Wather, 'History of the Second Army Corps'; The Century Company's 'Battles and Leaders of the Civil War' (Vol. IV).

E. A. Carman,

PAN, in Greek mythology, a rural divinity. Comparative philology, showing that the name is related to *pastor* (Latin, "shepherd"), agrees with the results of modern mythological study, which traces its various attributes back to an original god of the flocks, so that we can credit neither the decadent explanation of his name, from the Greek word meaning "all," by his being the son of Penelope and *all* the suitors, nor agree with the Stoics who made of him a god of the universe, the ever-present spirit of nature in *all* things. It seems evident that Pan was originally a shepherd god of Arcady; indeed the figure that Arcady cuts in modern pastoral poetry seems to be due entirely to its mention in classic authors in connection with the pastoral god. Considered as a typical shepherd Pan naturally develops into hunter, fisherman and, in time, warrior; and "Panic fear" or "panic" is explicable as an extension of the unreasoning terror that seizes a flock of sheep. Another school of mythologists stress the fact that Pan was an Arcadian god, make his various rural activities merely those of the normal Arcadian and explain his warlike functions by noting that the Arcadians were often mercenaries; but this scheme fails to explain the myth of Pan's love of Selene, the moon-goddess, which is perfectly explicable if we reckon the god a shepherd who must "watch by night." The Arcadian myths of Pan's birth are many; the commonest make him son of Zeus and Callisto, or of Hermes and a daughter of Dryops and associated him closely with Dionysus. The myth and the cultus of Pan spread slowly through Greece. He was not worshipped at Athens until after the battle of Marathon, where the panic of the Persian army was accredited to him. Compare Browning's poem 'Pheidippides.' In Rome Pan was identified with Faunus or Inuus and later confused with the Satyrs, so that *Panes* and *Panisci* were spoken of; moreover his nature was sensualized somewhat, so that in early Christian times he became par excellence the god of Greek heathenism. Hence the myth of the death of Pan at Christ's birth; and hence too, because of the representation in art of Pan as a horned being half-man, half-goat, the popular picture of the devil. Earlier Greek art, it must be remembered, made of him merely a beautiful young shepherd, only occasionally giving him horns, such as were worn by other divinities of nature, notably the river-gods. Consult Wieseler, 'De Pane' (1875); Roscher, 'Ueber Selene und Verwandtes' (1890); Stuart, 'The Great God Pan' (1913).

PAN-AMERICAN CONFERENCE OR CONGRESS, a title given to the meetings of delegates from various countries of North, Central and South America to consider questions of mutual interest. A desire for the unification of the different American nations was felt as early as 1826, when the Panama Congress, then projected, failed to meet. In 1831, 1838 and 1839–40, Mexico called a meeting, but there was no response. In 1847–48, Bolivia, Chile, Ecuador, New Granada and Peru sent delegates to a meeting, but they adjourned without effective results. Another fruitless meeting was held at Santiago in 1856, Peru, Chile and Ecuador being represented. In 1846 Peru called a conference at which eight republics met to organize a Latin-American Union and "to organize into one family the former Spanish colonies." No report was made of this meeting. In 1878 still another meeting was held without results. In 1881 invitations were issued by James G. Blaine, then Secretary of State of the United States, for a Latin-American Congress to be held in Washington the following year, but the project was abandoned. In 1888–89 South American jurists met, but made no political recommendations. Finally, 10 May 1888, President Cleveland was authorized to call an International American Conference to meet in Washington the following year. Delegates were then present from all the governments of South and Central America except Santo Domingo. The object was the furtherance of international comity and commerce, including a customs union, sanitary regulations, intercommunication, uniform weights and measures, a common silver coin and a plan of arbitration. The only practical result was the establishment of the International Bureau of American Republics. On 22 Oct. 1901 delegates from 19 countries were present at a conference in the City of Mexico to consider arbitration, an international court of claims and the reorganization of the Bureau of American Republics. Many resolutions were adopted and the congress adjourned to meet at Rio de Janeiro, 23 July 1906. Among the subjects considered by this congress was the Drago or Calvo Doctrine forbidding governments to collect privately debts by force. Elihu Root was present and spoke of the desire of the United States to have fair and friendly relations with all other Pan-American powers. The Conference referred many points to The Hague Conference, especially the collection of international debts without recourse to arms. A number of valuable recommendations were made regarding recognition of patents, trademarks and copyrights. Municipal sanitation was also discussed at length. The fourth meeting of the Conference was held at Buenos Aires, 9 July 1910. At this time the name of the Bureau of American Republics was changed to the Pan-American Union. This bureau is supported by contributions, and Andrew Carnegie led with $750,000 while $250,000 was added by the 20 republics, this having been invested in a permanent house in Washington for the bureau, which has collected a large library of literature bearing on Pan-American topics. A Pan-American scientific congress has also been organized and held sessions in Chili in 1908, and Washington, D. C., in 1912. A Pan-American Commercial Congress met at Washington in 1915 and discussed ways and means for meeting the usual conditions growing out of the World War and hampering commerce in the Americas.

PAN-AMERICAN EXPOSITION, a fair held in Buffalo, N. Y., from 1 May to 1 Nov. 1901. Financially it was a failure, due largely to President McKinley's assassination, which caused a temporary closing. The total cost of the exposition was $8,860,757.20; the total receipts $5,478,589.37. See Exposition, Industrial.

PAN-AMERICAN UNION. The official international organization of the 21 independent republics of North and South America maintained by them in Washington for the development of commerce and trade, intercourse and good understanding and the preservation of friendship and peace among them. It is controlled by a governing board composed of the Secretary of State of the United States, who is chairman ex-officio, and the diplomatic representatives in Washington of the other American republics. It is administered by a director-general, who is elected by this board, and is, therefore, an international officer. He, in turn, is assisted by a large, trained expert and clerical staff who compile information, make research investigations, prepare reports and publications, answer inquiries, receive visitors and conduct correspondence. The Pan-American Union occupies a building on 17th street, between B and C streets near the entrance to Potomac Park in Washington, which has been described by a great French architect as "combining beauty of architecture, nobility of expression and practical usefulness more than any other official structure in the United States." It has sometimes been described as the Capitol of the Western Hemisphere in the Capital of the United States. Erected through the munificence of Andrew Carnegie and the contributions of all the American republics, it stands as a beautiful and useful monument to the cause of Pan-American solidarity and relationship.

In its practical work of spreading accurate information about the American republics and making them better acquainted, not only with themselves but with other countries of the world, the Pan-American Union publishes an illustrated monthly *Bulletin*, with English, Spanish, Portuguese and French editions, which is circulated all over the Americas and Europe and is an attractive record of the general progress of each American country. It also prepares, prints and distributes descriptive pamphlets of each constituent country of the Union, reports on a great variety of subjects and other data of an informative character. Last year it distributed nearly 1,000,000 pieces of printed matter relating to the American republics, but all of these were sent out in response to requests or to persons, firms and institutions interested.

One of the notable features of the Pan-American Union is the Columbus Memorial Library, the largest up-to-date collection in the world of practical Pan-Americana. This library contains nearly 45,000 volumes indexed with 150,000 cards, nearly 2,000 maps and atlases and 25,000 photographs. On the tables of its reading room can be found the principal newspapers and other publications of the Latin-American countries.

Perhaps a feature of the Pan-American Union which appeals to the interests of the world is its governing board, or international council, which makes the Pan-American Union a real league of peace among the American nations. On the first Wednesday of every month in the governing board room of the Pan-American Building, around a great oval table, with the chairs carrying the names and escutcheons of the constituent governments, there meets this council made up of the Secretary of State of the United States and the highest representatives in Washington of the other governments. From one to two hours they consider ways and means of so administering the Pan-American

Union as to develop the closest relationship among the American republics and to insure permanent peace among them. Since the reorganization of the Pan-American Union in 1907, following the Pan-American Conference held at Rio de Janeiro in 1906, there has been no war between any two American republics, and the moral influence of this council has probably prevented several wars on the American continent. It has been said that the Pan-American Union is a working league of nations which might be well described as the prototype of a World League to preserve peace.

Through the educational informative work of the Pan-American Union and the efforts of the United States and other governments, the commerce exchanged between the United States and the 20 Latin-American countries has grown in the last 12 years from approximately $500,000,000 to $1,750,000,000. The Pan-American Union has, moreover, devoted its energies to making the study of the Spanish and Portuguese languages and the geography, history and characteristics of the Latin-American countries popular among the educational institutions of the United States. It has tried to do a corresponding service for the United States in the Latin-American countries. It favors the movement for the exchange of college professors and students between the educational institutions of the United States and Latin-America. It regularly provides the leading newspapers of North and South America with information about the various Pan-American countries which will make them better acquainted with, and more interested in, each country. In many respects the Pan-American Union can be described not only as a great active organization for the development of commerce and cultural relations and the preservation of peace, but an international bureau of information for the Western Hemisphere. Any person seeking information of whatever character relating to Latin America will have his inquiry carefully considered and answered if he addresses the Pan American Union, Director General, Washington, D. C.

The present executive staff of the Pan-American Union includes the following: John Barrett, director-general; Francisco J. Yánes, assistant director; Franklin J. Adams, chief clerk and editor of the *Bulletin;* W. C. Wells, chief statistician; W. A. Reid, chief trade adviser; C. E. Albes, assistant editor; V. A. Wood, chief accountant; Angel C. Rivas, Spanish translator and assistant editor; C. E. Babcock, acting librarian.

PAN-GERMANISM, a movement, originating in German imperialism and the German race-consciousness, born of the establishment of the empire, having for object the uniting of all European people of Germanic stock wherever located into one great national unit. The movement crystallized finally in the foundation of a society styled the universal German League (*Allgemeiner deutscher Verband*) on 9 April 1891. On 1 July 1894 the name was changed to the Pan-German League (*All deutscher Verband*) and at the same time was founded the official organ of the League, the *Pan-German Gazette* (*Alldeutscher Blätter*). Some persons prominent in the Pan-German movement disclaimed all ulterior motives on the part of the League in regard to political affairs and territorial acquisitions abroad, asserting the while that the sole object of the movement was to spread a knowledge of German culture — manners, customs, social polity, etc., throughout the world. They asserted their belief that there was much in German home life, education, government, social policies, etc., that was of prime interest to the rest of the world and a knowledge of which would result in great benefits, both material and spiritual, to the human race as a whole. Others identified with the movement expressed most pronounced beliefs in regard to the ultimate destiny of the Teutonic peoples, whose culture they regarded as so superior to that of the rest of mankind that they deemed it the duty of all Germans to further its progress and extend its power abroad so that ultimately by sheer weight of its worth it might become a world culture and the world, mentally, if not politically, might become a German world. The Pan-Germans from time to time gave expression to their policies, especially in regard to a strengthening of national consciousness; they advocated determined colonial and emigration policies, and sought to safeguard German interests abroad through energetic diplomatic intervention. In 1903 the League formulated its program as follows: (1) To quicken the patriotic self-consciousness of Germans, and to offer opposition to all movements antagonistic to national development; (2) To treat and solve all questions bearing upon the bringing up of children and higher education in the Germanic sense; (3) To watch over and support all German national movements in all countries where Germans have to sustain a struggle in support of Germanism, with the object of embracing and uniting all Germans on the globe; (4) To promote an active German policy of interests in Europe and across the seas, and especially to further the colonial movement to practical results.

In the four years from 1898 to 1902 the membership of the League grew from 12,000 in 82 branches (28 outside of the homeland) to 21,924 in 217 branches. With the opening decade of the 20th century the Pan-Germans, now wielding a vast influence, began to extend their activities to the ends of the earth and to pour forth a stream of literature in the shape of books, pamphlets and newspaper articles in an effort to catch up with the Anglo-Saxon world movement launched years before. Indeed, the Pan-Germans of the more radical type early recognized in Great Britain the one great obstacle to the realization of their ideals. The latter had had the ear of the world for generations and the Germans, though late in the field, were determined to make up for lost time by intensive and sedulous propaganda.

Thus far we have dealt merely with the Pan-German movement as regards its origin, development, aims and methods. In the course of the late war popular propaganda in Allied countries charged the Pan-Germans with almost every crime and misdemeanor under the sun, and with being in accord with the ruthless policy of the Imperial German Government. Much of this had best be forgotten; it served its purpose by keeping the people keyed up to the effectual prosecution of the war and its continuance would only serve to keep alive racial bitterness and hatred. Few previous to the war would have believed it possible that the press of all countries — both of the Entente and its opponents — could be prostituted to the degree we witnessed during the war. However, it is important here to examine the connection between the Imperial German Government and the Pan-German movement, if any such existed. Undoubtedly very many officials high in the councils of the Empire were also prominent in the Pan-German movement, but the degree to which they influenced or were influenced by the latter we are unable to determine. We have, however, the repeated assertions of the German authorities that the Pan-German movement was the work of but a very small group of the German people, and that it had at no period of its history received any official sanction.

Pan-Germanism carried on its work in the open; its aims and objects were published to the world and its literary product reviewed in the press of all countries. In Germany, itself, the movement was not widely acclaimed. It was vigorously opposed by a not inconsiderable number of men in public life and also by the Socialists, whose prominent leaders took advantage of every opportunity to denounce it as a menace to the German working class, contrived by the militaristic caste as the advance guard of their grasping imperialistic policy. In Pan-Germanism we have, therefore, a movement of a very small but very powerful group organized to further German culture, if not German domination, throughout the world. This movement was recognized and commented upon in other countries; it was opposed by influential men and by a great political party in Germany itself; it never received any recognition from the imperial German government, although at times the policies of both were identical; during the war every utterance of a German imperialist or militarist was imputed to the Pan-Germans and their coterie, perhaps more often than not erroneously, since many of such utterances were made on individual responsibility in an effort to maintain the morale of the German nation at home as well as on the fighting front. The collapse of the empire in 1918 proved the greatest setback Pan-Germanism had ever received. It saw the realization of its aims and ideals postponed indefinitely, and to the world in general the movement appeared dead. That it did not die, however, was shown by the public pronouncements of the League during the sessions of the Peace Conference, more especially soon after the terms of the peace treaty had been communicated to the representatives of the new German government. See War, European: Historical Introduction and Chronology.

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PAN TADEUSZ (Master Thaddeus). Under the influence of Homeric studies, but more especially of Goethe's 'Hermann und Dorothea,' Mickiewicz began to write his superb epic, 'Pan Tadeusz,' and published it in 1834. The poet intended to treat Master Thaddeus as the Polish hero whose life and love was to be a parallel to that of Hermann, hence he chose a similar name for his poem. But, as he proceeded, the sum total of Lithuanian life in the beginning of the 19th century obtruded itself upon his vision, and the title now no longer corresponded to the matter in hand. The critic Gostomski has admirably characterized 'Pan Tadeusz' as something like a musical symphony which begins with an idyllic theme, through which may be heard the harsher tones calling to battle or the plaintive notes of an elegy. These themes uniting render perfectly the essence of Lithuania. Dissonances appear, the theme grows, the martial and elegiac notes prevail. Then, as the battle theme subsides, a new melody strikes the ear. We hear the cry of despair and of a suffering soul, a mighty tragic storm approaches, and all ends with a song of overwhelming contrition. The poetic symphony ends with a superb, harmonious finale, in which the previous motives are united.

In the Middle Ages the executive branch of government was feebly developed as compared with the legal side, hence it became necessary for the winning party to make forcible inroads in order to enforce the legal decision. This state of society prevailed in Lithuania up to the 19th century, and such an inroad was called in Polish *zajasd*. Mickiewicz used the theme of an old feud between two houses and the *zajasd*, in order to depict in epic form the whole of the late Lithuanian past, and, at the end of the poem, allowed the feud to subside, the parties uniting in welcoming into Poland Napoleon, from whom salvation was expected. The critical literature of 'Pan Tadeusz' is very large. Probably the best work is W. Gostomski's 'Arcydzieło poezyi polskiej A. Mickiewicza Pan Tadeusz' (Krakowie 1894). In English a study may be found in Monica M. Gardner's 'Adam Mickiewicz' (London 1911, ch. 6, pp. 155–182). 'Pan Tadeusz' was translated into English (London 1885) by Miss Maud Ashhurst Biggs; a new translation by Prof. George R. Noyes was published in London 1917.

Leo Wiener.

PANA, pä'nạ, Ill., largest city in Christian County, on the Baltimore and Ohio, the Cleveland, Cincinnati, Chicago and Saint Louis, the Illinois Central and Chicago and Eastern Illinois railroads, 32 miles southeast of Springfield. It was settled about 1845; incorporated 1867, taking its name from an Indian tribe which in earlier days inhabited this region. It is located in the fertile corn belt; corn, hay, wheat and fruit being the principal products. Underlying the region surrounding Pana is an extensive coal field and there are numerous coal mines furnishing employment to over 1,500 miners. Its excellent railroad facilities make it an advantageous manufacturing city. There are a soda-fountain factory and wood-working establishments.

It is distinguished by having the highest altitude of any city in Illinois. It has five ward schools, one parochial school and a large township high school; a free public library; a large Y. M. C. A., Huber Memorial Hospital, a beautiful city park of 40 acres; over 14 miles of paved streets with an adequate water supply system. It has a City Court with concurrent jurisdiction to that of the Circuit Court of the county. Pana was settled in 1853 and incorporated in 1867. It has an aldermanic form of government under the general law of the State. Pop. 7,000.

PANÆTIUS pą-nē'shĭ-ŭs, **Rhodius,** Stoic philosopher: b. Rhodes, about 180 B.C.; d. Rome, about 110 B.C. He spent most of his life in Rome disseminating the tenets of Greek and more especially of Stoic philosophy. Here he enjoyed the friendship of Lælius and the younger Scipio. He subsequently traveled extensively in the East and visited Egypt and on his return opened a Stoic school at Athens. He really belonged to the middle Stoic or Eclectic school and borrowed from Plato and Aristotle. Only fragments of his writings are extant to-day. His chief treatise was one on 'Duty,' from which Cicero in his 'De Officiis' has drawn much material. Consult Van Lynden, 'De Panætio' (1802); Schmekel, 'Die Philosophie der mittlern Stoa' (1892).

PANAMA. A country of Latin America, bounded on the north by the Caribbean Sea, on the east by Colombia, on the south by the Pacific Ocean, and on the west by Costa Rica. We find in the interior a great number of hills and mountains, a few being extinct volcanoes. These have no geological connection either with the North American Cordilleras or with the Andes. The only systematic ranges are a bit of the Costa Rica central divide, which runs over into western Panama, and on the Atlantic Coast further east the Cordillera de San Blas. The detached and irregular hills are often separated by streams, greatly subdivided, whose banks (like the hillsides and, indeed, the greater part of the country) are covered with dense tropical vegetation. The exceptions to this rule are a few treeless uplands along the Pacific side between the Costa Rica border and the Gulf of Panama. The rivers and streams are the ill-named Rio Grande and the Chagres, which have been factors in the Canal Zone problems; the Tuyra and the Bayano, in the eastern and central regions; and in the western region, where the water-parting is more distinctly marked, many rivulets that flow from the central range northward to the Caribbean or southward to the Pacific. The area of the republic was officially given in 1916 as 32,380 square miles. Of the Canal Zone (see PANAMA CANAL) the area is 474 square miles. Political aspects of the acquisition of this strip, the precise terms of the grant, etc., are examined and stated in the section *History.*

Climate.— The chief hydrographer of the Panama Canal, Mr. F. D. Willson, writes that on the Isthmus average temperatures decrease approximately one degree Fahrenheit with every 330 feet increase in elevation. The influence of the Caribbean Sea, lying to the windward, is shown in the climate of the Atlantic Coast, which is nearly of the moist and equable oceanic type; but climatic conditions on the Pacific slope and throughout the interior exhibit many of the characteristics of the continental type because the prevailing winds over these sections blow from off the Isthmian land areas. A large percentage of the rainfall comes in the form of afternoon tropical showers, the period from 2 o'clock P.M. to 3 P.M. being the hour of heaviest rainfall as a general rule. Almost the only general storms that visit the section of the Isthmus traversed by the canal are the so-called «northers» during the period from October or November to April, inclusive. Characterized by steady winds of a velocity of 30 or more miles per hour, these «northers» may or may not be accompanied by heavy rainfall. The winds alone are usually of insufficient force to hinder navigation at the Atlantic entrance of the canal; the high waves accompanying these storms, however, were injurious to shipping interests before the breakwaters that now protect the inner bay were constructed. The average annual sea temperature is about 82° F. on the Caribbean Coast and 80° F. on the Pacific side. The absolute range on the former side is only about 12° F., while on the latter (at Balboa) the absolute range is 29° F. Hail has fallen in the Canal Zone or vicinity three times since observations were begun in 1906. Water spouts have been seen at both canal entrances. Generally speaking, the climate is unhealthful except in those places where modern sanitation methods have eliminated the causes of tropical diseases.

Seismology.— Before the occupation of the Canal Zone by the commission from the United States there had been 28 recorded earthquakes, but only one or two that can be classed as destructive — possibly the shock which occurred in 1621 and certainly that of 7 Sept. 1882. Since 1904 seismic disturbances were thought to be negligible except during the fiscal year 1913–14 and in 1915. During the former year 87 shocks were recorded at Ancón. Of these 55 or 56 were of comparatively local origin, less than 200 miles distant; 31 or 32 were tremors from shocks of remote origin. Nearly all of the local shocks appeared to originate about 115 miles southwest of Ancón Hill in Los Santos Province. Ten of these were felt generally over the Isthmus, and the shock of 28 May 1914 damaged slightly the new Administration Building at Balboa. In 1915 sharp shocks were felt on 24, 25 and 26 January and on 28 June. These did not originate in the Zone, and caused little damage there or elsewhere on the Isthmus.

Tides.— On the Pacific side the average tidal range for consecutive tides is about 12.5 feet, the maximum spring range occasionally exceeding 20 feet; but at the northern entrance to the canal the average tidal range is only about 0.9 foot, and the extreme range approximately two feet. Within and beyond this tidal area we find a coral formation of a comparatively recent date, which fringes both the Pacific and Caribbean coasts and extends inland several miles near the rivers.

Chagres River, The.— This famous river is formed by the confluence of two streams at Dos Bocas, the main stream originating among the mountains of the San Blas cordillera, where peaks 2,000 to 4,000 feet in altitude are found. Mr. Willson says that although nearly the entire country from headwaters to the neighborhood of the canal is clothed with vegetation, much of which is dense, the slopes are so precipitous and rock lies so near the surface that severe tropical rain storms cover its banks with small torrents and cascades, from time to time causing the river to rise suddenly and to discharge almost incredible volumes of water. Its drainage area before it reaches the canal is 1,320 square miles. In the upper reaches there are two cañyons, each about a mile in length, and a number of rapids. By damming its waters at Gatun, the engineers of the commission have formed the dominating feature of the Panama Canal — Gatun Lake, which has an area of 164 square miles at an elevation of about 87 feet above sea-level and contains 192.24 billion cubic feet of water.

Fortifications.— Modern defensive works are maintained only in the neighborhood of the canal. General Goethals (see *Bibliography*) writes: «In 1910 Congress voted in favor of fortifying the canal and, subsequently, of having a garrison permanently located within the Zone. These defenses consist of seacoast fortifications for the protection of the entrances against naval attack and land defenses around the locks, the most vulnerable features of the canal, against any force that might be landed from an attacking fleet for raiding purposes.»

Political Divisions, Population, Cities.— The republic of Panama is divided into eight provinces as follows:

PROVINCES	Capitals	Population of Capitals
Bocas del Toro	Bocas del Toro	9,000
Coclé	Penonomé	6,000
Colón	Colón	30,000
Chiriqui	David	15,000
Herrera	Chitré	6,000
Los Santos	Los Santos (Las Tablas)	8,000
Panamá	Panamá	50,000
Veraguas	Santiago	7,000

The number of inhabitants was given as 450,000 in 1916. (Pan-American Union, *Latin America*, Washington 1916). The estimates for 1911 and 1912 were, respectively, 337,000 and 341,000, exclusive of the Canal Zone. In the republic as a whole the mestizos are most numerous (about 190,000 to 200,000); whites about one-fourth as many.

History.— Columbus landed on the Isthmus in 1502. Then came further exploration and in its train colonization, still in the first quarter of the 16th century. In the more flourishing days of Spanish rule in that century and the next the country in general and the city of Panama in particular enjoyed the advantages coming from the shipment of South American silver and gold. But this prosperity had so dropped at the close of the 18th century that Panama was largely isolated from Colombia and took comparatively little part in the various revolts that culminated in Colombian independence in 1819. Two years after that date, however, the people of Panama proclaimed their independence and became part of the old republic of Colombia. This was a strongly centralized government held together by little but Bolivar's personal influence and power. It was shattered in 1831, the year after his death, and three new republics were formed, namely, Venezuela, Ecuador and New Granada. The last named included the Isthmus. Strangely enough the form of government of the new republic was practically identical with that which had brought it to revolt against Colombia, and equally ill-adapted to its heterogeneous elements. Moreover, there was no simple and speedy means of intercommunication such as might have welded the country into some national unity. In the existence of this type of government is the philosophic key to the history of both the old republic of Colombia down to 1831, and after that date of New Granada, the United States of Colombia, and the republic of Colombia (the present name of the country). It was in the very nature of things that as New Granada had broken from Colombia, so Panama, New Granada's remotest part, must break, or attempt to break from New Granada. A state's rights or Federalist party did rapidly rise throughout New Granada. In 1840 revolutions broke out in most of the provinces. An independent «State of the Isthmus,» containing the provinces of Panama and Veraguas, was proclaimed in 1841, but the Centralists were successful, the revolution was suppressed, and the old régime was restored. The sentiment against this method of government steadily increased until in 1855 by an act of the Congress of New Granada at Bogotá the autonomous state of Panama was erected out of the Isthmian provinces. But the sincerity of this act may well be questioned and its aim was probably political and the purpose to crush the Federalist party for good and all. But the attempt of the national government to revoke its act, and, it seems, to provoke a revolution, and then in crushing that revolution to put a stop to all Federal agitation, over-reached itself. The revolution in behalf of the new constitution was completely successful. For a score of years and more Panama, like the other states in the Colombian Union, enjoyed (more or less interruptedly) its individual rights. A Centralist uprising in 1885, however, effected a return to old conditions. The former state of Panama was again ruled from Bogotá, and became a department called Panama. This department was divided into four provinces, Chiriqui, Veraguas, Azuero and Panama; the last named province occupied the eastern half, approximately, of the department of the same name, with which it is very easily confused.

During this revolution in 1885 the United States landed marines to protect the transit of the Isthmus between the cities of Colón and Panama, a circumstance of material assistance to the Centralist insurgents, but an act undertaken simply for the sake of inter-oceanic and trans-Isthmian commerce. That it could have been for any reason other than this is impossible, since the right and duty of the United States to preserve neutrality in the Isthmian strip was due to a treaty made in 1846 with the government of New Granada, a government not in existence in 1885. In short, the obligation was one to a territory and not to any power; and if to any power simply to that in control of the Isthmus, no matter what its relation to the original treaty-making power.

After 1885 the relations of Panama with Colombia were no closer nor more familiar than before. Several revolts took place, and in July 1900 under the lead of Porras, later a leading candidate for the vice-presidency of the republic, a desperate but unsuccessful attempt was made by a Liberal army to get control of the city of Panama. In 1903 a more successful plot was planned, growing out of the discontent of the people of Panama with the attitude of Colombia toward the Panama Canal Treaty with the United States. Whether through fear that the United States would in time gain sovereignty over the canal — there was an old saying that the canal when built would become the southern boundary of the United States — or a hope that the bid for the canal might be largely increased, the Colombian Congress refused to ratify this treaty and adjourned 31 Oct. 1903. By the terms of the Spooner bill this made the Panama Canal apparently an impossibility and the Nicaragua Canal a certainty, for the President had been bidden to treat for the Panama Canal, and if such negotiations failed, to carry through the project of the Nicaragua Canal. In short, the people of Panama would have been deprived of the fulfilment of their hopes of renewed commercial importance by this inexplicable action of the Colombian Congress, had not the revolution planned as early as the summer of 1903 offered a solution. How the desire for autonomy, the desire for a canal and the desire for the money to be paid for the canal, respectively, bulked in the minds of the revolutionary plotters it is difficult to say. The foregoing sketch of Panama's political history would show at least that a revolution for purely political reasons was a possibility. The mixture of motives amounts to little more than a coincidence of several impulses, each of which alone would have been sufficient. On 3 Nov. 1903 — that is three days after the adjournment of the Colombian Congress — the municipal council of the city of Panama proclaimed the independent republic of Panama. There was no bloodshed. An army of 400 Colombians (mostly boys between 12 and 14) arrived 4 November in Colón, whence its general with his staff went to Panama; and upon his refusal to acknowledge the new republic, of which he knew nothing until the evening of the 4th, was imprisoned for a few days, but on the 7th with his army was shipped back to Cartagena from Colón. In the meantime upon 6 November the United States recognized the new republic, being satisfied that there was not the slightest internal opposition to its establishment. France's recognition followed 10 November, and soon afterward like action was taken by Germany, England and Russia. The remarkable haste with which the provisional government was recognized by that of the United States is not without precedent; in a Senate debate 5 Jan. 1904 Senator Lodge pointed out that in 1848 the French republic was recognized after three days and that the republic of Brazil had received formal recognition within two days after its formation. It is to be noticed also that Panama's government may justly be reckoned a "resumption" of previous independence. As to the action of our government in landing marines to protect the Trans-Isthmian Railroad its defense lies in an appeal to the Treaty of 1846, to the precedent of 1885, when the Centralist cause was as much (and as unintentionally) aided as it was checked in 1903, and to the principle that it is the Isthmian commerce that we aim to protect by keeping the strip neutral rather than any government, and hence that an appeal from any established power in the Isthmus for protection of the railroad must be met by speedy and unhesitating action. The objections to this view of the case and the disagreement with the actions of the existing administration came from various sources: first, as in the case of the New Haven petition sent to the Senate 11 Jan. 1904, from unpartisan constitutional experts; and second from the opposition in Congress and the supporters of the Nicaragua route, who saw their last chance to win. The New Haven petitioners simply asked the Senate to make a careful and deliberate investigation. The opposition in Congress (and in the press) urged that the revolution in Panama was fostered if not actually started by the Republican administration (Roosevelt's) and the landing of troops was for the purpose of preventing Colombia from subjugating the rebellious department; in fine, that both revolution and recognition grew out of pure self-interest in the proposed canal. Whatever the merits of these arguments, the inability of the Democratic caucus to bind its members to oppose the Canal Treaty, the instructions from the Mississippi legislature to the senators from that State, and 11 Jan. 1904 the practical confirmation of the nomination of W. I. Buchanan to be Minister to Panama by the tabling of Senator Morgan's motion to reconsider, seemed to show that the actual opposition was political and temporary.

The provisional government founded 3 November was in the hands of a junta consisting of J. A. Arango, Tomas Arias and Federico Boyd. The last-named member of the junta arrived in the United States on 18 December and late the same day a Canal Treaty was signed by Secretary of State John Hay and the Minister from Panama to the United States, Philippe Bunau-Varilla, who had been formally received at Washington eight days before. This treaty closely resembles the convention made with Colombia; the compensation is the same; but the canal strip is made wider and the powers granted to the United States are larger. The junta named above took control of the government, being assisted by the following provisional cabinet: Minister of Government, Eusebio Morales; Minister of Finance, Dr. Manuel Amador Guerrero (later elected President); Minister of Foreign Affairs, F. V. de la Esprilla; Minister of Justice, Carlos Mendoza; Minister of Public Instruction, N. Victoria; and Minister of War and Marine, M. de Obarrio, Jr. On 27 December a general election of delegates to a national convention took place. In most instances municipal authorities acted as electors, the scheme of manhood suffrage originally promulgated having proved impracticable. Four delegates were chosen from each province except Panama, which elected eight, making a total of 32, These delegates, meeting 15 Jan. 1904, were called to frame a constitution and to elect a President. The provisional government ratified the Canal Treaty 2 Dec. 1903, and five days afterward the treaty was submitted to the United States Senate for ratification by that body. On 16 Feb. 1904 Guerrero was elected President, with Arosemena, Obaldia and Mendoza as *designados,* or vice-presidents.

Article 2 of the treaty between the United States and the Republic of Panama, which was ratified by the United States Senate 23 Feb. 1904, and went into effect 26 Feb. 1904, provided for the cession, in perpetuity by Panama, of a strip of territory adjacent to the canal, as follows:

«The Republic of Panama grants to the United States in perpetuity the use, occupation and control of the zone of land and land under water for the construction, maintenance, operation, sanitation and protection of said canal of the width of 10 miles, extending to the distance of five miles on each side of the centre line of the route of the canal to be constructed; the said zone beginning in the Caribbean Sea, three marine miles from mean low-water mark, and extending to and across the Isthmus of Panama into the Pacific Ocean to a distance of three marine miles from mean low-water mark, with the proviso that the cities of Panama and Colon and the harbors adjacent to said cities, which are included within the boundaries of the zone above described, shall not be included within this grant. The Republic of Panama further grants to the United States in perpetuity the use, occupation and control of any other lands and waters outside of the zone above described which may be necessary and convenient for the construction, maintenance, operation, sanitation and protection of the said canal or of any auxiliary canals or other work necessary and convenient for the construction, maintenance, operation, sanitation and protection of the said enterprise. The Republic of Panama further grants to the United States in perpetuity the use, occupation and control of all islands within the limits of the zone above described, and in addition thereto the group of small islands in the Bay of Panama named Perico, Nacs, Culebra and Flamingo.»

In compensation the United States paid $10,000,000 for the concessions and agreed to pay $250,000 annually, beginning in the 10th year after the ratification of the treaty. The uneasy conditions prevailing throughout the Central American countries during 1907 and the early part of 1908 were particularly manifest in Panama, especially as the time for the election of a new President drew near. This uneasiness caused some apprehension at Washington lest the Canal Zone might become affected in some way. Charges had been made by one of the political parties that frauds had been perpetrated in the previous elections and that the members of the opposition party had not been allowed to register. A request was, therefore, sent in May 1908 to the United States to appoint a commission to assure a fair election. In order to pacify all the political elements Secretary of War Taft was sent to Panama. Ricardo Arias, Secretary of Foreign Relations, was the candidate of the Government party for the presidency and José Obaldia was the candidate of the Liberal party in opposition to the government. The latter, while popular with the people, was not so with the government and apprehension was expressed lest the former should use the power of the government and police forces to hold a dummy election and declare himself elected. Upon his arrival Taft decided to appoint American representatives to observe the elections which were to be held on 12 July, and made it plain to the political parties that if frauds were permitted that might lead to disorder, riot or insurrection the United States would preserve order according to the terms of the treaty. A commission of electoral inquiry was appointed by Panama to investigate and a list of the actual voters in each polling precinct was made. Thereupon Arias withdrew from the contest and Obaldia was elected almost without opposition.

Government.— By the provisions of the constitution adopted 13 Feb. 1904, the country has a centralized republican form of government. The executive authority is vested in a President elected for a term of four years by popular vote; the President is assisted by a cabinet of five members. The legislative branch of the government consists of a single body of deputies called the National Assembly and the members are elected for four years. The sessions of this Assembly are held at the city of Panamá once every two years, and extraordinary sessions may also be called by the President of the republic. The judicial branch comprises a Supreme Court of five judges, appointed by the President for a term of four years; a Superior Court and several Circuit Courts (appointments to both made by the Supreme Court for four years); and Municipal Courts, whose judges are appointed by those of the Circuit Courts for one-year terms. For local government the republic is divided into eight provinces, each of which in turn is divided into municipal districts. The affairs of the provinces are administered by governors, appointed by the President of the republic for one-year terms, and those of the municipal districts by mayors and municipal councils, the latter elected by direct vote for two years, the former (the mayors or «alcaldes») appointed for one year by the provincial governors.

Education.— The Department of Public Instruction has charge of all elementary, secondary and special schools and establishments of learning, both public and private; of the Pedagogical Library and of the National Museum. The system of public education includes the kindergarten, for children five and six years of age, and primary schools for children of the ages seven to 14; these primary schools being organized in six grades, for which official courses of study are provided; and the instruction must be under official supervision even when given in private schools or at home. An obligatory course of only three years is established in rural schools. Among the special institutions above referred to are the School of Arts and Crafts, the National School of Music, the College of Commerce and Languages, the National Institute and a recently established school for the instruction of native Indians. (Consult 'Report of Commissioner of Education,' Washington 1915, and Pan-American Union handbook 'Panama,' Washington 1916). In 1917 the National

Assembly authorized the executive to found and maintain a Pan-American University in Panama City. The university is to give preference to courses in Spanish and English literature, tropical medicine and law. The National Institute of Panama is to serve as a base for the new university. Altogether the government maintains 398 public schools throughout the provinces. There are about 375 teachers in these schools and about 22,000 pupils (excluding 1,720 children enrolled in the schools of the Canal Zone). There are also about 12 private institutions and about 60 young men and women are being educated in the United States and elsewhere at the cost of the Panama government.

Industry and Commerce.— The cultivation of bananas on a large scale and of cacao, sugar-cane, tobacco, rice, maize, etc., on a small scale, should be mentioned. Agriculture is practically undeveloped because of poor transportation facilities. The sugar industry is important in Los Santos and Veraguas, but could be greatly extended. The cocoanuts and pineapples of this region deserve their good report. Stock-raising is also an important branch (estimated number of cattle about 200,000; horses, 15,000; mules, 2,000; pigs, 30,000; and goats, 5,000). Mining is carried on in the Darien district and Veraguas Province; pearls are obtained at the Pearl Islands, Panama Bay, and coral and sponges are found near the coasts. Forest products are both valuable and interesting. Manufactures are few and unimportant. Chocolate, mineral waters, ice and soap are made for local consumption. The government maintains a monopoly in the production of tobacco, cigars, cigarettes and salt, and lets these to individuals. A law fixing the responsibility of employers for accidents to workmen was passed by the Congress of Panama on 6 Nov. 1916, and was promulgated in the *Gaceta Oficial* 10 days later. One of the features of the law is that if insurance companies are established in the country, employers may insure their employees for the amounts which would be due them in case of injury by accident while at work. The part of the law that provides for indemnity to victims of accident became effective 16 May 1917, while the remainder of the law went into effect on 16 Feb. 1917.

Chief exports are bananas, cocoanuts, cocobola wood, ivory, nuts, medlar juice, mother-of-pearl, hides, tortoise shell, rubber (from trees scattered in the forests), skins, ipecac, sarsaparilla, brown sugar, cacao and balata. Chief imports are rice, cigarettes and cigars, sugar, lard, coffee, kidney beans, eggs, candles, chocolate, Indian corn (maize), cheese, beer, food pastes, petroleum, gasoline, leather, butter, leaf-tobacco, etc. In the last normal year before the European War (1913) imports from the United States were valued at $6,378,702.29; from Great Britain, $2,465,431.54; from Germany, $1,078,167.72; from France, $336,816.38; from China and Japan, $266,772.62; from Spanish America, $238,684.48; from Belgium, $208,539.98; from Italy, $168,881.59; from Spain, $162,574.09. The total foreign trade in that year was $16,780,027.59 (imports valued at $11,397,000.05 and exports $5,383,027.54). In 1914 the total imports were valued at $9,885,475 and the exports at $5,163,000. Of the total imports $6,396,275 came from the United States (exclusive of canal materials), $1,835,890 from Great Britain, $460,455 from Germany, $211,725 from France, $109,090 from Italy and $300,835 from Belgium. In 1916–17, 38,000 quintals of sugar were produced. Imports in 1916 totaled $9,397,365 and exports amounted to $5,706,725. Of the imports $6,674,990 came from the United States (exclusive of canal materials), $1,267,145 from Great Britain, $143,290 from France, and $38,590 from Italy. In the same year (1916) the chief exports were bananas, $2,370,555; cocoanuts, $805,825; balata, $461,000; tallow, $333,280; and hides, $284,205.

Banking and Finance.— The monetary system is based on the gold standard, its unit being the *balboa*, divided into 100 centesimos and representing 1.672 grammes of gold .900-fine, or 1.5046 grammes of pure gold, equivalent to $1 currency of the United States. In actual circulation are silver half balboas, locally called pesos, and fractional silver and nickel coins, together with currency of the United States on a par basis. The revenues of the republic declined 30 per cent after July 1914, the causes being (as stated in 'Proceedings of the First Pan-American Financial Conference' Washington 1915) the diminution of imports due to the European War and the establishment (by the government of the Canal Zone) of commissaries privileged to import merchandise without payment of duties. On 26 Oct. 1915 an extraordinary session of the National Assembly was held to consider pressing financial problems. A contract with New York financiers (1915) provided for the establishment of the Bank of Panama, one-fourth of the directors to be named by the government of Panama. That bank, acting as fiscal agent and depository of the Republic of Panama, has power to issue legal tender notes up to the value of its capital. The revenue for 1916 was $5,311,000 and the expenditure $5,823,000. The budget for the biennial period — 1 Jan. 1917 to 31 Dec. 1918 — was planned to balance at $7,198,170. The republic has $6,000,000 invested in the United States and $750,000 capital in the Bank of Panama. A loan of $3,000,000 was negotiated in New York in 1915 for the construction of the Chiriqui Railway.

Transportation.— Steamships from the United States and Europe, from South America and the West Indies, enter the port of Colón on the north coast; on the south coast, Balboa, the Canal Zone's Pacific port, is visited regularly by steamers from both north and south. A railroad three miles long connects Balboa with Panama City, from which the main line of the Panama Railroad extends to Colón, 48 miles. Other railway systems are those of the Bocas del Toro region, 151 miles of narrow-gauge track designed chiefly for the service of the banana industry and of the Pedregal, David and Boquete south-coast districts. The latter, when completed, will be about 52 miles in length. In 1917 a concession was granted for the construction of a railway on the Atlantic Coast from the mouth of the Chagres southwest to Almirante, about 31 miles. The Chirique line is about 80 miles in length. The great difficulty experienced in constructing and maintaining good roads on land through the tropical jungles directs attention to the possibility of improving and utilizing the rivers for transportation. At present, the Tuyra River is navigable for many miles by small craft, and the same may be said of a number of other streams; but it is also true that floods during the rainy season (see *Climate*) prohibit continuous use. The government is planning extensive improvements in various parts of the country to facilitate communication and internal development. Provision was made in the 1917 budget for the construction of new roads and the repair of old ones, for the building of bridges, wharves and warehouses, etc. On 26 Sept. 1916 the new port of Mandinga, about 80 miles from Colón, was opened. An appropriation of $200,000 is made for roads from Penonome to Puerto Posado and from Ancton to Penonome, another from the latter place to Cahecera and to Rio Chico.

Police, Post and Telegraph Offices.— No army is maintained, its place being taken by a national police corps of 1,000 officers and men. There are 96 post offices, handling about 2,500,000 pieces of mail-matter annually; 37 telegraph offices and two wireless-telegraph stations. The government in December 1916 appropriated $25,000 for the installation and maintenance of a telephone line in the province of Colón, along the Atlantic Coast, starting from the city of Colón and terminating in Santa Isabel. Construction was begun 1 Mar. 1917. A concession for the establishment and maintenance of electric plants and telephone systems throughout the republic was granted by the government of Panama in March 1917. It was provided that the American concessionaire, when employing labor in accordance with the terms of that concession, must give preference to natives of Panama and must retain them in the proportion of at least 50 per cent. There are telegraph cables from Panama to North American and South American ports and from Colón to the United States and Europe.

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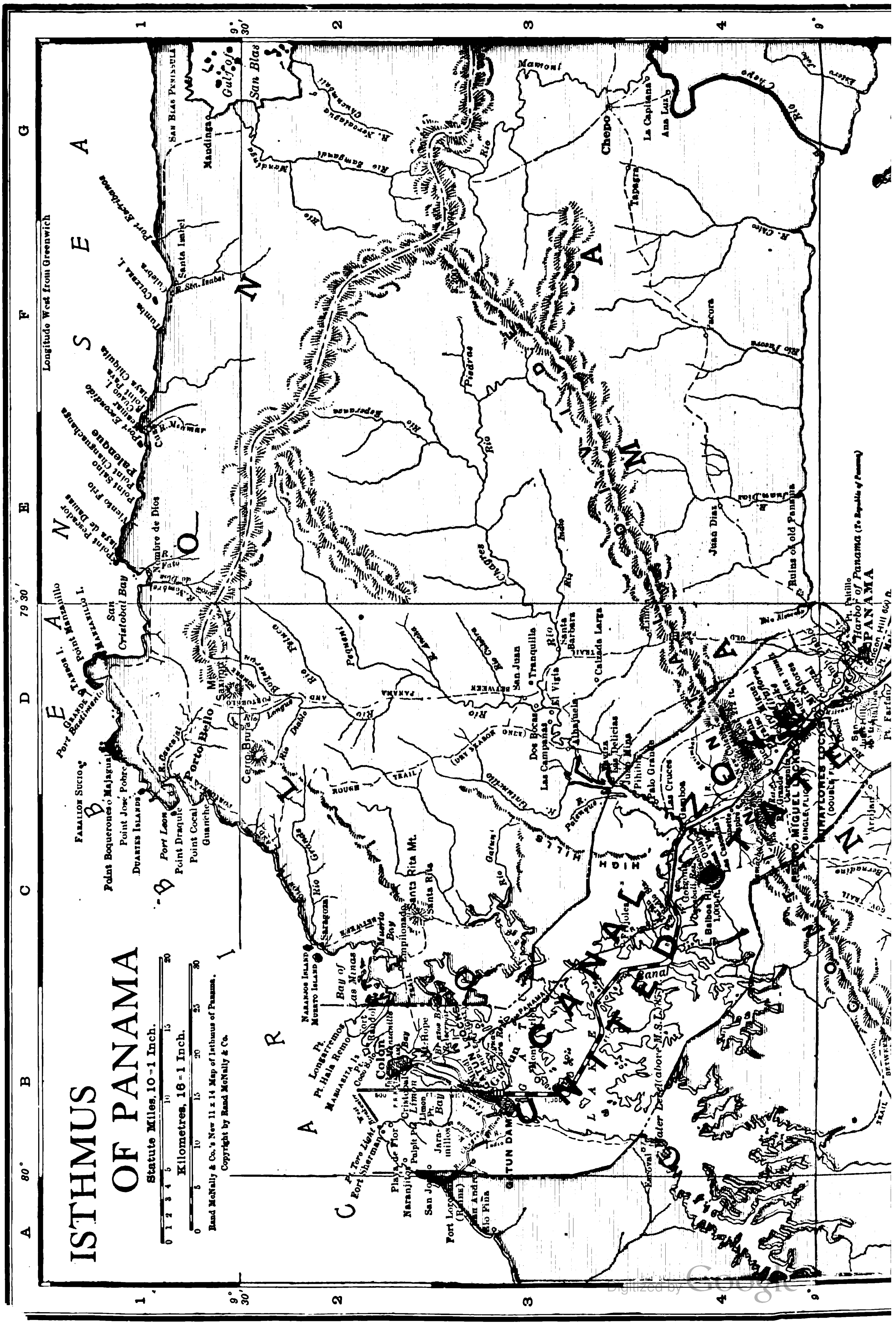
MARRION WILCOX.

PANAMA, capital of the Republic of Panama, situated on a coral peninsula running into the Gulf of Panama. It has no actual port, but vessels anchor safely between the mainland and a chain of islands. Founded near the Pacific Coast in 1519 by Pedrarias Dávila, Panama became wealthy in the days of the Peruvian mines, and was the oldest and richest colony in America in 1671 when it was taken, looted and burned by the buccaneer, Sir Henry Morgan (q.v.). The present city, six miles from the site of the old, was built two years after, and with its granite fortifications was long the strongest Spanish fortress on the Pacific. The rush of gold-hunters to California in 1849 renewed its prosperity somewhat and in 1855 procured for it railroad connections with Colón, a new port on the Atlantic. Beside mere reshipping business it has the large part of the export trade of what is now the republic (and was the department) of Panama. The government buildings is one of the city's most creditable new structures in point of architecture, and has been designed rather ingeniously to serve a variety of purposes, the east and west wings being given over to the offices of the executive departments, while in the south wing are the National Assembly rooms and in the north the National Theatre. The buildings of the National Exposition of Panama, which threw open its doors hospitably in 1916, are also noteworthy. Striking contrasts of past and present, the ancient and the extremely modern, are offered by such buildings as Santo Domingo church or the moderately old cathedral, on the one hand, and on the other every token of modernity — the tramways, automobiles, electric lights, modern shops, etc. Panama is the social and commercial, as well as the political centre of the country; in it the revolution against Colombia was carried out 3 Nov. 1903. Pop. 37,600.

PANAMA, Isthmus of, the tongue of land connecting the central and southern American continents and varying in width from 31 to a little more than 110 miles, the former measurement being taken from the Gulf of San Blas and the latter including Azuero Peninsula. The Isthmus runs east and west with a double curve in either coast line, so that the western hollow made by Mosquito Bay on the north side and the eastern indentation of the Gulf of Panama on the south side, each with a corresponding bulge opposite, give the entire Isthmus the shape of a recumbent S or of the sign of variation. In this more extended use of the term the words Isthmus of Panama are applied to the entire Republic of Panama (q.v.), that is, what was formerly the isthmian segment of Colombia (q.v.). The term is also used to designate the eastern and narrower part, corresponding roughly with the Miocene causeway between the northern and the Neotropical regions (see the article on LATIN AMERICA — section *Fauna and Flora*), to which the name of Darien was originally applied. The isthmus was reached by Columbus in 1502, and was crossed in 1513 by Balboa, who «from a peak in Darien» discovered the Pacific. The cities of Panama and Nata were colonized before 1520. The Isthmus was also the scene of the Darien scheme of colonization fathered by William Paterson. In spite of its having been known so long to European explorers, large parts of the Isthmus remained as a virgin field for ethnologists, geographers and naturalists long after the first Canal Commission from the United States undertook the great constructive work. The geologist of the Isthmian Canal Commission contributed to the *Scientific American*, 18 Oct. 1913, pp. 303–305, a study of the geological conditions on the Isthmus, giving prominence to the fact that there are, within the Republic of Panama, high mountain groups, but few, if any, mountain ranges, properly so called. «The older geographies,» he writes, «informed us that



ISTHMUS OF PANAMA

Statute Miles, 10=1 Inch.

Kilometres, 16=1 Inch.

Rand McNally & Co.'s New 11 x 14 Map of Isthmus of Panama.

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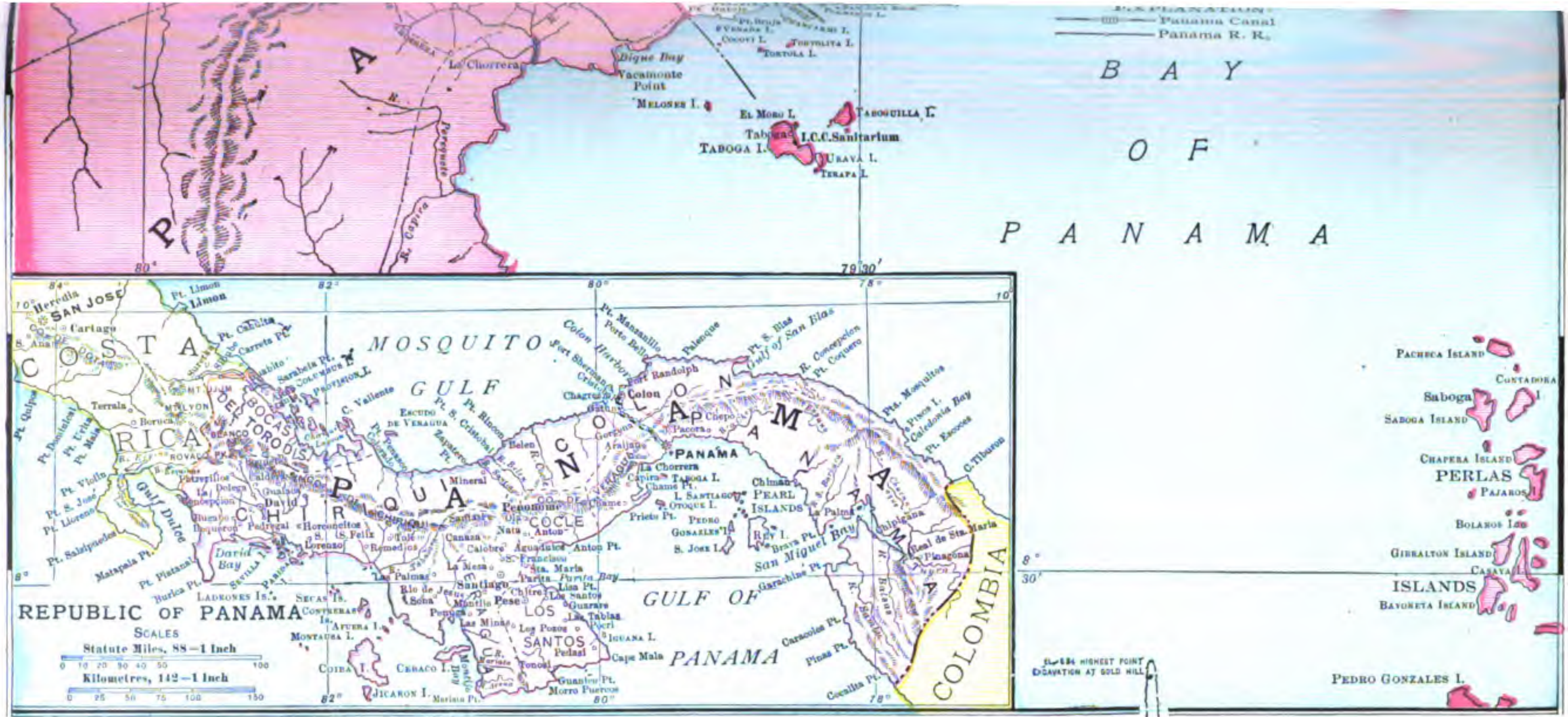
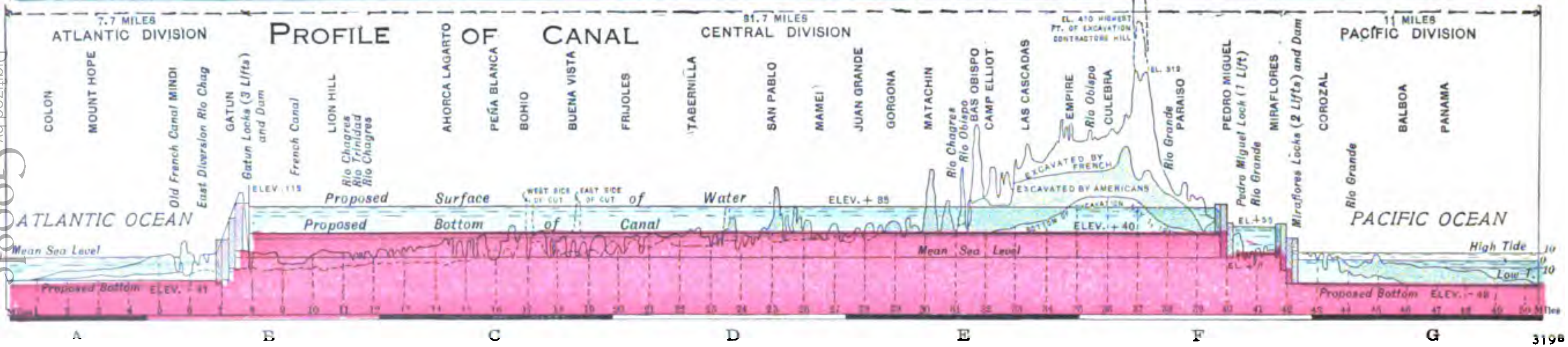

EXPLANATION:
Panama Canal
Panama R. R.
BAY OF PANAMA
P A N A M A
La Chorrera
R. Caimito
Perequete
R. Capira
Bique Bay
Vacamonte Point
Melones I.
El Moro I.
Taboga
Taboga I.
I.C.C. Sanitarium
Taboguilla I.
Urava I.
Terapa I.
Venado I.
Cocovi I.
Tortolita I.
Tortola I.
79°30′
80°
Pacheca Island
Contadora
Saboga
Saboga Island
Chapera Island
PERLAS
Pajaros
Bolaños Ids.
Gibraltor Island
Casaya
ISLANDS
Bayoneta Island
Pedro Gonzales I.
8° 30′
REPUBLIC OF PANAMA
SCALES
Statute Miles, 88 – 1 Inch
Kilometres, 142 – 1 Inch
COSTA RICA
San Jose
Heredia
Cartago
Pt. Limon
Limon
MOSQUITO GULF
Bocas del Toro
CHIRIQUI
David
Gulf Dulce
Coiba I.
Cebaco I.
Jicaron I.
VERAGUAS
COCLE
Santiago
LOS SANTOS
Penonome
Colon
Colon Harbor
Porto Bello
Chagres
Gatun
PANAMA
La Chorrera
PEARL ISLANDS
San Miguel Bay
GULF OF PANAMA
Cape Mala
San Blas
Gulf of San Blas
COLOMBIA
C. Tiburon
84°
82°
80°
78°
10°
8°
6
7
8


7.7 MILES
ATLANTIC DIVISION
PROFILE OF CANAL
31.7 MILES
CENTRAL DIVISION
11 MILES
PACIFIC DIVISION
COLON
MOUNT HOPE
Old French Canal MINDI
East Diversion Rio Chag
GATUN
Gatun Locks (3 Lifts) and Dam
French Canal
LION HILL
Rio Chagres
Rio Trinidad
Rio Chagres
AHORCA LAGARTO
PEÑA BLANCA
BOHIO
BUENA VISTA
FRIJOLES
TABERNILLA
SAN PABLO
MAMEI
JUAN GRANDE
GORGONA
MATACHIN
Rio Chagres
Rio Obispo
BAS OBISPO
CAMP ELLIOT
LAS CASCADAS
EMPIRE
Rio Obispo
CULEBRA
EL. 410 HIGHEST PT. OF EXCAVATION CONTRACTORS HILL
EL. 534 HIGHEST POINT EXCAVATION AT GOLD HILL
EL. 312
Rio Grande
PARAISO
PEDRO MIGUEL
Pedro Miguel Lock (1 Lift)
Rio Grande
MIRAFLORES
Miraflores Locks (2 Lifts) and Dam
COROZAL
Rio Grande
BALBOA
PANAMA
ATLANTIC OCEAN
PACIFIC OCEAN
Mean Sea Level
Proposed Bottom ELEV. – 41
ELEV. 115
Proposed Surface of Water
Proposed Bottom of Canal
WEST SIDE OF CUT
EAST SIDE OF CUT
ELEV. + 85
EXCAVATED BY FRENCH
EXCAVATED BY AMERICANS
BOTTOM OF EXCAVATION
ELEV. + 40
Mean Sea Level
EL. + 55
High Tide
Low T.
Proposed Bottom ELEV. – 48
10
0
10
Miles
1
2
3
4
5
6
7
8
9
10
11
12
13
14
15
16
17
18
19
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21
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the North and South American Cordilleras were practically one continuous chain from Alaska to Cape Horn. This is quite incorrect, for the mountains of Panama . . . are units quite distinct geographically from the greater northern and southern continental ranges. Furthermore, they have had a different origin, for they are not due to folding by lateral pressure, but originated from intrusions of volcanic rocks, as necks, cores, masses and irregular dikes.» These intrusive rocks are of five types: basalts, diorites, andesites, granodiorites and rhyolities. They were extruded in a molten condition through volcanic agglomerates, breccias and tuffs: through sandstones, limestones, argillites and shale beds, mostly of Oligocene age. A fact that any serious student will notice is that the bedded rocks cut by these bodies of igneous or volcanic rock are not well consolidated, except in the vicinity of the higher mountains where they have undergone such induration as the heat of the great masses of ejected lava occasioned. The basalt, the esite and rhyolite extrusions are principally post-Oligocene, «and seem to be largely Miocene in age.» The diorite is, at least in part, pre-Oligocene, probably of Eocene time. The fact that the earthquakes are coextensive with these mountain groups is evidence that the latter have been pushed up beyond the supporting power of their foundations and are even now settling back to adjustment. This consideration has an obvious bearing upon the problem of the «slides» in Culebra Cut. (See PANAMA CANAL). Both Gold Hill and Contractors' Hill are examples of such settled-down masses. Within the Canal Zone there are only two peaks that attain approximately 1,000 feet in altitude; and no summits within 30 miles of the Canal Zone are higher than 2,000 feet. In fact, this marked depression is so extensive that no mountains above 4,000 feet in height are found within 100 miles of the canal's terminal ports. In the western regions, however, and in those districts long the subjects of contention on account of the conflicting claims of the Republic of Panama (as inheritor of Colombia's contentions) and Costa Rica, we find high mountains, attaining 11,000 feet in two instances, and unquestioned evidences of much more recent plutonic activity. (For climate, fauna and flora, hydrography, ethnology, etc., see PANAMA; PANAMA CANAL).

PANAMA CANAL, a waterway connecting the Atlantic and Pacific oceans, cut through the Isthmus connecting the continents of North and South America. Its opening has solved the problem of international commerce which first intruded itself on the Western World in 1453 when Constantinople fell to the Turks and the great land routes to India and the Orient were closed to Christian Europe. Within half a century of the event Columbus set forth on his memorable voyage in search of a route to the East. When he reached the West Indies the natives told him of a strait through which it was possible to travel westward to the great sea over which lay an unhampered road to India.

Balboa also heard the legend of a water route to the west and explored the Isthmus of Panama in an endeavor to locate it. After his time the discovery of this mysterious stream furnished the chief incentive to most of the exploration up and down the coast. While the strait remained undiscovered, the search for it gave birth to the idea of digging a waterway which would connect the two oceans. To Hernando Cortez, conqueror of Mexico, belongs the honor of first proposing the construction of this water route. His plans were cut short by the treachery of his followers, but he encouraged his cousin, Alvaro de Saavedra Ceron, to continue the project, and the latter finally elaborated plans for four routes — Darien, Nicaragua, Tehuantepec and Panama — the identical routes which received so much attention in the 19th century. With the abdication of Charles V, who was favorable to the project, all interest in it was abandoned by his successor, Philip II. Interest in an interoceanic route was revived from time to time, however, and especially after the peoples of the Isthmus severed their political connection with Spain about 1823. Henry Clay was fully alive to the importance of the canal project, the completion of which (speaking in 1825), he said, «will form a great epoch in the commercial affairs of the whole world.» In 1826 Aaron H. Palmer of New York entered into a contract with the Republic of Central America to construct a canal capable of accommodating the largest vessels afloat. Failing to enlist the financial aid then deemed necessary ($5,000,000), Palmer's contract came to nought. President Jackson sent Charles Biddle to Nicaragua and Panama to examine the different routes, but the mission was nullified by the subsequent action of the President and Senate.

After the Mexican War, which planted the Stars and Stripes on the Pacific Coast, the commercial necessity for a transisthmian canal was recognized. Various plans were made and with each decade the need for the canal became more imperative. Several times a canal under American control seemed assured, but some difficulty of a political nature always arose. While discussion concerning a canal was rife, enterprising Americans had in 1855 linked up the Pacific and Atlantic coasts of the Isthmus of Panama by means of the Panama Railroad, which for a time relieved the congestion of transcontinental communication. The Civil War precluded for several years the construction of a canal, and before America was again ready to consider the project seriously the French had undertaken to engineer and finance the construction of a canal.

In 1876 Count Ferdinand de Lesseps became head of a committee which proposed to study the Isthmian Canal project. Its first meeting was held in May 1879, and was attended by 135 delegates, of whom 11 were from the United States. The «International Congress» decided that the Panama route was the most feasible, the most practicable route, having the Bay of Panama and the Gulf of Limon as terminals of a sea-level canal, which it was estimated would cost $240,000,000. Meanwhile in 1878, Lucien N. B. Wyse and associates had secured a concession from the Colombian government granting the exclusive privilege of constructing and operating a transisthmian canal for a period of 99 years.

The French Company.—As a result of the deliberations of the International Congress a company was organized on 17 Aug. 1879 under the title Compagnie Universelle du Canal Interoceanique de Panama, with Count de Lesseps as president. The Wyse concession was purchased for 10,000,000 francs ($2,000,000) and the company set about making exact detailed surveys. The company was capitalized at $80,000,000, in shares of $100 each, which were opened to public subscription. The plan adopted by de Lesseps was for a sea-level canal 30 feet in depth, 72 feet bottom width and an estimated length of 47.2 miles, involving the excavation of 160,000,000 cubic yards of rock and earth, at a cost now placed at $168,000,000 within a period of nine years. Beginning in February 1883 actual excavation was entered upon and within a short time there began to arise those serious obstacles which had been foreseen by the trained engineers who had voted against de Lessep's project at the conference. It was found that the estimates were far too low. By the middle of 1885 scarcely one-tenth of the estimated minimum excavation had been effected, and it was evident to all that the program originally outlined could not be carried out. Severe criticism and passionate discussion of the enterprise took place in France and the credit of the company being seriously impaired it was deemed necessary to resort to irregular and corrupt practices. Many members of the French legislature were corrupted. De Lesseps relinquished the directorship in 1887 and returned to France to be tried and disgraced in the courts of his native land. In the same year the lock-type of canal was adopted, but it was now too late to save the enterprise, and in 1889 the Civil Court of the Seine appointed a judicial receiver. The company was declared to be bankrupt, and examination showed that 80,000,000 cubic yards of earth and rock had been excavated at a cost of $265,938,600; of this sum only $156,654,687 was actually expended at Panama. The company was dissolved by the court and a liquidator appointed to take charge of the property and to carry out the enterprise if possible and with power to cede any or all of the assets to a new company. Extensions of time were secured from the government of Colombia. The New Panama Canal Company was organized in 1894 with a capital stock of 65,000,000 francs or 650,000 shares of 100 francs ($20) each. Fifty thousand shares were given Colombia for a further extension of time, leaving about $11,700,000 as working capital. The assets and property of the old company were transferred to the new by the liquidator and a commission of 14 engineers was appointed to investigate the project. Their report was favorable and excavation went on slowly, the new company expending about $9,000,000 and excavating 5,500,000 cubic yards by the close of 1899. Meanwhile, public sentiment in the United States had become strongly impressed with the desirability of a transisthmian canal under American control. The Nicaragua route was generally favored by members of Congress and others, a fact which caused extreme anxiety to those interested in the New Panama Canal Company. The directors of the latter decided to bring the comparative merits of both the Nicaragua and Panama routes before the American government. The full report of the technical committee of the latter company was laid before President McKinley in December 1898. In March of the following year the President was authorized to make an exhaustive investigation as to the most practicable and feasible route for a transisthmian canal that should be under the complete control of the United States and the absolute property of the latter. The President thereupon appointed the first "Isthmian Canal Commission" which was composed of the following members: Rear-Admiral John C. Walker, U. S. N.; Hon. Samuel Pasco; George S. Morison; Lieut.-Col. Oswald H. Ernst, U. S. A.; Lewis M. Haupt, C.E.; Alfred Noble, C.E.; Col. P. C. Hains, U. S. A.; Wm. H. Burr, C.E.; Prof. Emory R. Johnson. The commission examined the project of the New Panama Canal Company both at Paris and at Panama, and thereafter tried to have the company state definitely the conditions and terms under which its property and rights might be transferred to the United States. The company was reluctant to state its terms explicitly and as a result the commission reported in favor of the Nicaragua route in November 1901. When this report became known in France, the New Panama Canal Company was at once reorganized with new executives and immediately offered its property and rights in the canal to the United States for $40,000,000. This change of front on the part of the company, who saw their last chance of disposing of their property slipping away, caused the commission to make a supplementary report, in which it advocated the Panama route as the most feasible in view of the altered conditions.

A long and somewhat acrimonious discussion of the relative merits of the Nicaragua and Panama routes ensued in Congress and not until June 1902 did legislation (Spooner Bill) pass authorizing President Roosevelt to acquire the rights and property of the New Panama Canal Company for a sum not to exceed $40,000,000 and to secure by treaty with Colombia the perpetual control of the territory needed for operating the canal; the law also provided for the prosecution of the work by an Isthmian Canal Commission consisting of seven members to be appointed by the President.

The American Enterprise.—After the enactment of the Spooner law, the provisions of which are outlined above, negotiations were entered upon with Colombia for a concession. If unable to secure a satisfactory title to the property of the New Panama Canal Company, or "to obtain by treaty control of the necessary territory from Colombia," the President was empowered to negotiate with Costa Rica and Nicaragua for a concession, and having secured the privileges desired, to construct the canal by the Nicaragua route. The purchase price to be paid the New Panama Company was not to exceed $40,000,000, including the Panama Railroad, and before paying over the money to the company the President was required to assure himself of the validity of the title to the property to be transferred and to await the exchange of ratifications of a satisfactory treaty with Colombia. The Attorney-General of the United States was promptly instructed to make the investigation concerning the validity of the title held by the New Panama Company, and his elaborate opinion, together with the data upon which his opinion was based, was laid before the President on 25 Oct. 1902. The Isthmian Canal Commission had previously investigated the title and nature of the concessions involved, as had also the Senate Committee on Interoceanic Canals. The commission's report contains a full historical and analytical discussion of the subject of concessions. The relations of the original Panama Canal Company to the New Panama Canal Company were set forth, and the opinion expressed that the New Panama Canal Company was able to sell its concession and property to the United States, provided the representative of the rights of the old company, the «liquidator,» gave his approval of the sale, and united with the new company in the offer to sell. Shortly after this report was made the New Panama Canal Company offered to sell out to the United States, and the liquidator gave his consent to the sale.

Treaty with Colombia.— The treaty granting to the United States the concession and rights necessary for the construction, operation and control of the Panama Canal was signed by Secretary Hay and the Colombian *chargé d'affaires*, 22 Jan. 1903, and ratified without change by the United States Senate, 17 March following. It is a lengthy treaty, containing 28 articles, but is remarkable for the conciseness and directness with which each provision is stated. The Canal Commission did not consider it necessary for the United States to acquire sovereignty over the territory adjacent to the canal. The desirability for the United States of having the sole and undivided ownership and control of the canal when constructed was emphasized, and the recommendation was made that the compensation to be paid by the United States should be definitely fixed either as a single payment, or as a predetermined annual payment, or as a combination of these two methods. The treaty authorized the New Panama Canal Company to sell out to the United States; exempted the Panama Railroad Company from its financial obligation to Colombia, and gave the United States a lease for a period of 100 years, renewable at the option of the United States, of a strip of land 10 kilometers wide across the Isthmus of Panama. The United States not only recognized the sovereignty of Colombia over this leased strip, but «disavows any intention to impair it in any way whatever, or to increase its territory at the expense of Colombia or of any of the sister republics in Central or South America.» The United States secured the right to construct the canal and harbors, to establish free ports at the termini of the canal, to maintain hospitals and drainage and sanitary works along the line of the canal and its dependencies, and to install waterworks and a sewerage system in Colón and Panama, with the authority to «collect equitable water rates during 50 years.» Colombia agreed not to cede or lease to any foreign power any territory in the Department of Panama, and the United States guaranteed that no country should be allowed to seize such territory. It was provided that the canal should be neutral in perpetuity, in conformity with the treaty of 18 Nov. 1901, between the United States and Great Britain; but the United States reserved the right to protect the canal.

The unexpected rejection of the treaty by Colombia in the summer of 1903 at once put a new phase on the question and the promoters of the Nicaragua route again advanced their project and once more discussion was rife in regard to the relative merits of the two routes.

Treaty with Panama.— The successful revolt of Panama from Colombia in November 1903, as fully described under PANAMA (q.v.), and the immediate recognition of the new republic by the United States and other governments, however, confined the canal question to the Panama route. The provisional government of Panama at once arranged a new treaty with the United States government for the construction and control of the canal, differing from the treaty with Colombia in that the Canal Zone was enlarged, and greater powers granted to the United States. This, known as the Hay-Varilla Treaty, was signed at Washington 18 Nov. 1903 and ratified in Panama 2 Dec. 1903. By its terms the United States guarantees and will maintain the independence of the Republic of Panama. Panama grants the use in perpetuity of a zone 10 miles wide, and its exclusive control for police, judicial and other purposes; cedes territory for subsidiary canals and the coast line within the zone; and if police and other matters in the cities of Panama and Colón prove unsatisfactory, the United States may intervene. The canal is to be neutral and open to the world's commerce. For these grants the United States agreed to pay $10,000,000 on the ratification of the treaty and $250,000 yearly beginning after 10 years. The sovereignty of Panama over all her territory to be recognized.

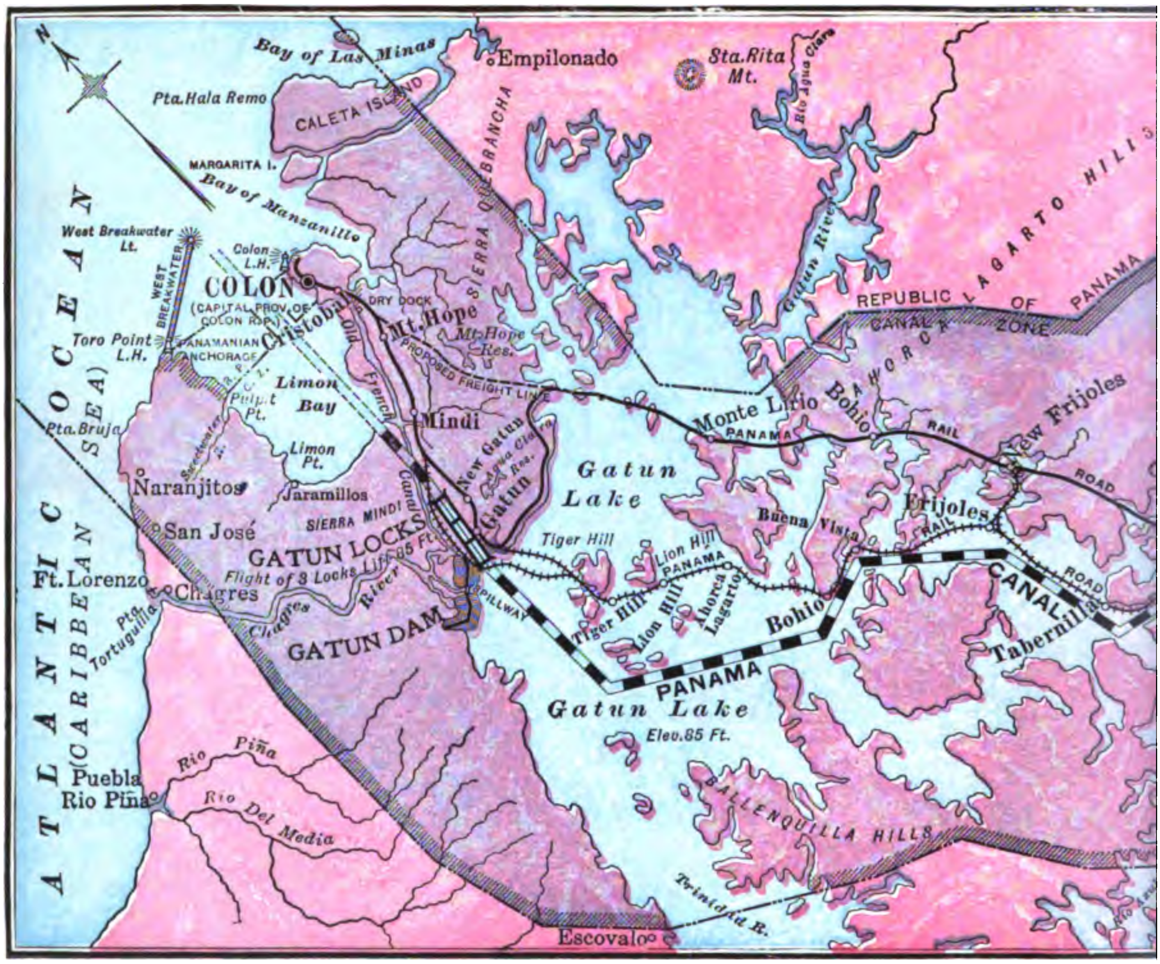
Plan and Organization.— On 4 May 1904 the United States took possession of the canal site and property. Major-General Whitfield Davis was appointed head of the Canal Commission with gubernatorial powers within the zone, his assistants being William Barclay Parsons, New York, William H. Burr, New York, Benjamin M. Harrod, Louisiana, Carl E. Crinsky, California, and Frank J. Hecker, Michigan. The preparatory work was begun on the plan of high-level locks, as favored by Congress in 1902. The average summit-level proposed was to be 85 feet above mean tide. This was to be secured by a dam at Bohio, the most important structure of the high-level canal. The dam proposed by the French Panama company was to be of clay founded upon a variety of material — hard clay, soft clay, sand, gravel, etc. The Isthmian Canal Commission decided upon a core-wall-and-earth dam, the core-wall to be carried down everywhere to rock, the latter being reached in places at a depth of 128 feet below sea-level. On 19 Dec. 1904, however, the chief engineer of the Isthmian Canal Commission laid his report before the Congressional Committee of Commerce. He was in favor of a return to the original plan of a sea-level canal as the best and cheapest in the end. The cost was estimated at $300,000,000 and the time of construction 20 years.

Early in 1905 the Engineering Committee (Messrs. Parsons, Burr and Davis) also issued a report recommending a sea-level canal, which they estimated could be completed in 10 or 12 years for $230,500,000. As outlined by them the canal was to extend 49 miles from the 36-foot depth mark in Colón Harbor to the similar depth-mark in Panama Harbor, and with a bottom width of 150 feet, was to be 30 feet in depth. As regards the natural features of the Isthmus, the first section from the Atlantic to Bas Obispo is 29 miles of low, marshy and unhealthful surface, thick with tropical vegetation; work here was facilitated by the considerable amount of excavation done by the French, and a stretch of completed waterway. The second and most difficult section of the canal was in the hill ground from Bas Obispo to Pedro Miguel, 7.91 miles, and known as the Culebra Cut. The route was so well chosen, however, that it afforded the lowest crossing in the ridge between the oceans. The third section from Pedro Miguel to the Pacific, nine miles, is similar to the Atlantic side, low, marshy and unhealthful. The greatest difficulties to be overcome were in keeping the floods of the Chagres under control and the cut through the rocky height of Culebra, the isthmian backbone and continental divide rising 300 feet above sea-level, nine miles from the Pacific.

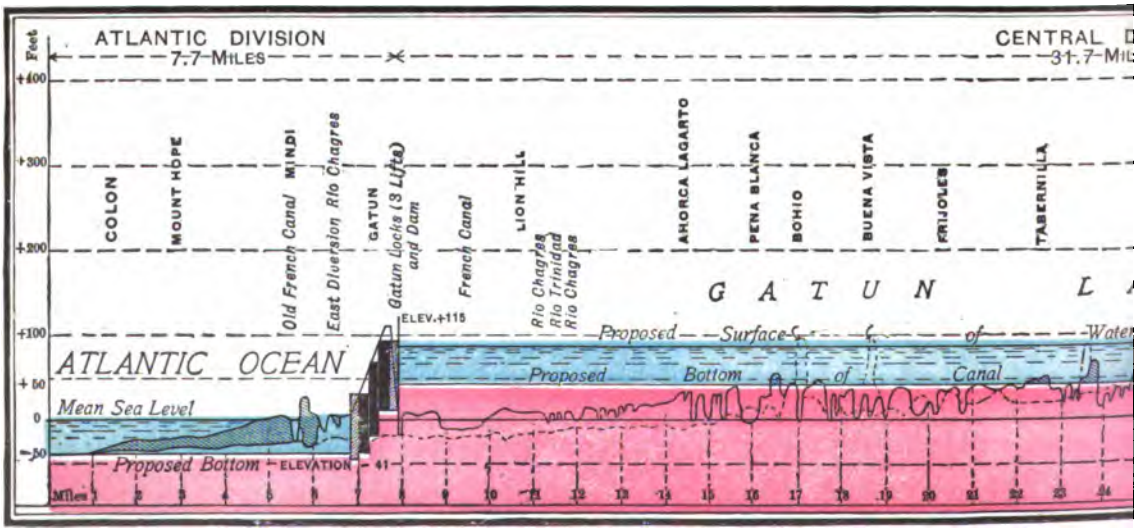
In consequence of the recommendations a series of radical alterations were made in the United States canal program for 1905, but on 30 March, Secretary Taft sent to President Roosevelt a drastic statement concerning the whole scheme, which was acted upon with such promptitude, that an executive order was issued on 3 April, reorganizing the Canal Commission. Theodore P. Shonts was appointed chairman, Charles E. Magoon was appointed governor of the Canal Zone and also to serve as Minister to Panama; John F. Wallace, chief engineer; Rear-Admiral M. T. Endicott, U. S. N.; Brig.-Gen. Peter C. Hains, U. S. A.; Col. Oswald H. Ernst, Engineering Corps, U. S. A.; and B. M. Harrod. A comprehensive list of instructions concerning the duties of the new commissioners was issued. In June Mr Wallace was succeeded by Mr. J. F. Stevens as chief engineer. Among other recommendations of Secretary Taft was the formation of an advisory board to consider the best design of canal. A board of consulting engineers was appointed, which after several sittings divided on the plan of canal.

Sanitation.— Meanwhile preparatory work proceeded upon the canal cuttings but during the summer of 1905 the work of excavation was virtually suspended. The mortality had proved alarming and Governor Magoon diverted most of the labor to sanitary work. Attention was devoted to the draining and oiling of marshes for the destruction of mosquitoes propagating malaria and yellow fever, to the sewerage systems of the Isthmus, and to a good water supply for the cities of Panama and Colón with the result that the mortality from yellow fever was soon completely reduced. The housing, provisioning and entertainment of the laborers in the Zone were also arranged. Colonel William C. Gorgas of the Medical Department of the Army began the remarkable work of sanitation, without which it is doubtful if the canal could ever have been completed, certainly not without an appalling loss of human life. General Gorgas's interesting book, 'Sanitation in Panama,' contains the best account of the admirable achievements in this department. We have no means of telling (General Gorgas says, in effect) what was the sick rate of the French during the period of construction under the old French company, from 1881 to 1889, but we know that it was very large. We can safely calculate that their constant sick rate was at least 333 per 1,000, or one-third their force. Now our force during the 10 years of construction averaged 39,000 men. If we had had a similar constant sick rate, we should have had 13,000 sick employees in our hospitals every day during the 10 years of construction. As it was, we had only 23 per 1,000 sick each day, a total of 900 for the whole force; that is, we had about 12,000 fewer men sick every day than had the French. This 12,000 men per day saved from sickness must be credited to the sanitary work done on the Isthmus. Now let us consider the totals: We had an average of 900 men sick every day. For the year, this would give us 328,500 days of sickness, and for the 10 years, 3,285,000 days of sickness. If our rate had been 300 per 1,000, a very moderate figure compared with what it was under the French, we should have had 11,700 sick every day. For the year this would have given us 4,270,500 days of sickness, and for the 10 years 42,705,000, a saving of 39,420,000 days of sickness during this period. This saving must be credited to sanitation. Again, it cost us about $1 a day to care for a sick man on the Isthmus. The commission cared for the sick free of charge. Therefore every day of sickness prevented lessened the expense that the commission had to bear by $1. It follows that the commission saved by the work of its sanitary department, if we consider the whole 10 years of construction, $39,420,000.

This represents only one phase of the saving due to sanitation. We must further consider that, if 300 men out of every 1,000 had been sick every day, the efficiency of the other 700 would have been correspondingly decreased. The other 700 would have been more or less debilitated and more or less depressed, and the amount of work turned out daily by each man would have been considerably less than it actually was for the employees enjoying good health and cheerful surroundings. The commission would have had to pay considerably higher wages if the Isthmus had continued to bear the reputation it had always borne during the years preceding 1904; if, for instance, it had been known that three out of every 10 men going to work on the canal would be sick all the time, and that two out of every 10 would die each year, and that the whole 10 would be dead at the end of five years. Great loss was caused in the first years of the American assumption of the task by the demoralization among the working force, and almost stoppage of work, which took place during periods of exacerbation in the yellow fever period or when prominent employees died of that disease. Great loss also occurred to the French on this account. Those most familiar with the conditions state that a larger sum in dollars and cents was saved to the commission in these ways than was saved by the direct decrease in the number of sick. Considering all these factors an estimate was made that the sum of $80,000,000 was saved to the United States by the sanitary work done on the Isthmus during the 10 years of construction. This is the purely commercial side of the question. Of much greater importance is the moral argument that can be adduced from the saving of


N
Bay of Las Minas
Empilonado
Sta. Rita Mt.
Rio Agua Clara
Pta. Hala Remo
CALETA ISLAND
SIERRA QUEBRANCHA
MARGARITA I.
Bay of Manzanillo
West Breakwater Lt.
WEST BREAKWATER
Colon L.H.
COLON
(CAPITAL PROV. OF COLON REP.)
Cristobal
DRY DOCK
Mt. Hope
Mt. Hope Res.
PROPOSED FREIGHT LINE
Toro Point L.H.
PANAMANIAN ANCHORAGE
Limon Bay
Pulpit Pt.
Limon Pt.
French Canal
Mindi
Gatun River
LAGARTO HILLS
REPUBLIC OF PANAMA
CANAL ZONE
Monte Lirio
PANAMA RAIL ROAD
Bohio
New Frijoles
ATLANTIC OCEAN
(CARIBBEAN SEA)
Pta. Bruja
Naranjitos
Jaramillos
New Gatun
Agua Clara Res.
Gatun
Gatun Lake
SIERRA MINDI
GATUN LOCKS
Flight of 3 Locks Lift 85 Ft.
Chagres River
Tiger Hill
Lion Hill
Ahorca Lagarto
Buena Vista
Frijoles
San José
Ft. Lorenzo
Chagres
Pta. Tortuguilla
SPILLWAY
GATUN DAM
PANAMA CANAL
Tabernilla
Gatun Lake
Elev. 85 Ft.
Puebla Rio Piña
Rio Piña
Rio Del Media
BALLENQUILLA HILLS
Trinidad R.
Escovalo

PROFILE


Feet
ATLANTIC DIVISION
7.7 Miles
CENTRAL D
31.7 Mi
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COLON
MOUNT HOPE
Old French Canal
MINDI
East Diversion Rio Chagres
GATUN
Gatun Locks (3 Lifts) and Dam
ELEV. +115
French Canal
LION HILL
Rio Chagres
Rio Trinidad
Rio Chagres
AHORCA LAGARTO
PENA BLANCA
BOHIO
BUENA VISTA
FRIJOLES
TABERNILLA
GATUN LA
Proposed Surface of Water
Proposed Bottom of Canal
ATLANTIC OCEAN
Mean Sea Level
Proposed Bottom
ELEVATION -41
Miles
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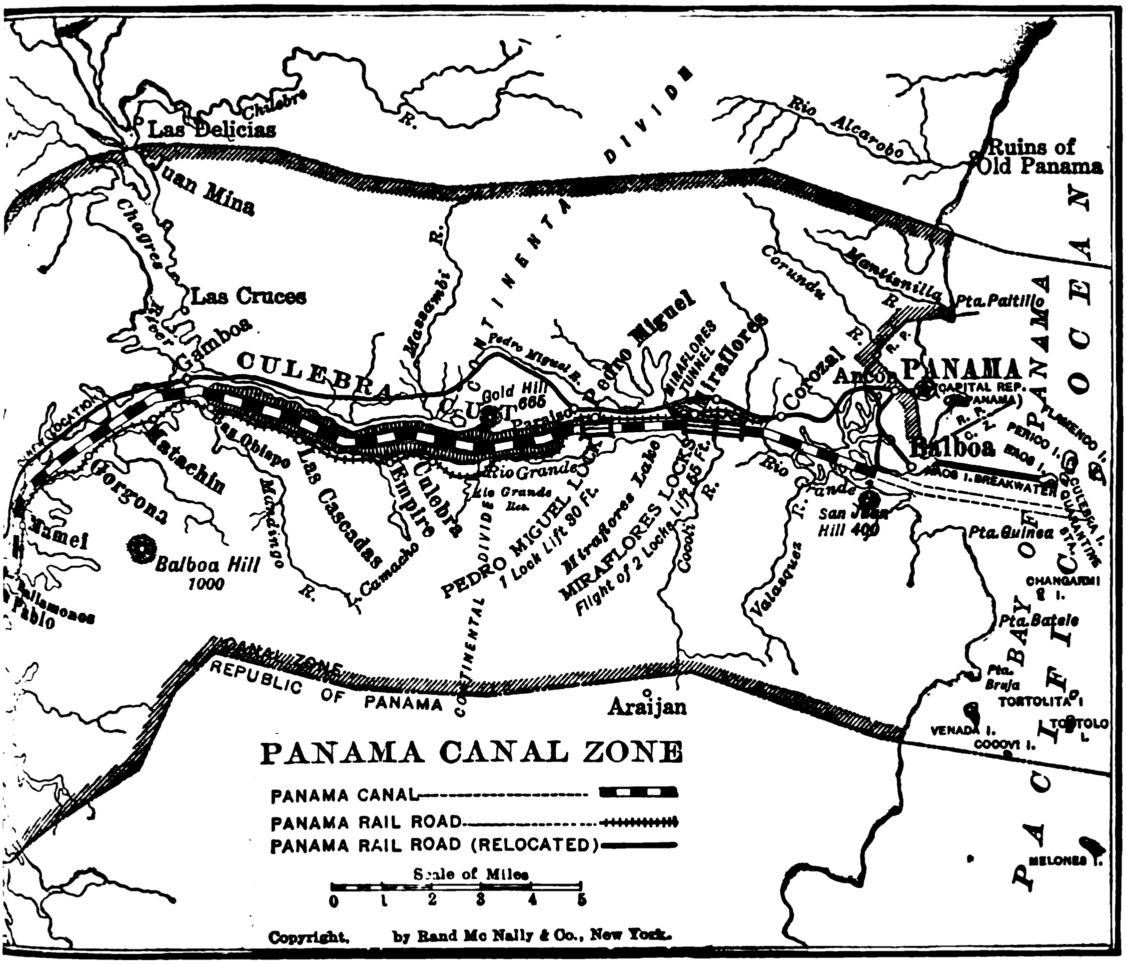
Las Delicias
Chilebre R.
Juan Mina
Chagres River
Las Cruces
Gamboa
CULEBRA
CONTINENTAL DIVIDE
Rio Alcarobo
Ruins of Old Panama
Corundu R.
Montisnilla R.
Pta. Paitilla
Pedro Miguel R.
Pedro Miguel
MIRAFLORES TUNNEL
Miraflores
Corozal R.
Ancon
PANAMA (CAPITAL REP. OF PANAMA)
Balboa
Gold Hill 665
Paraiso
Rio Grande
Rio Grande Res.
Matachin
Gorgona
Mamei
Balboa Hill 1000
San Pablo
Bailamones
Bas Obispo
Mandingo R.
Las Cascadas
Empire
Culebra
Camacho R.
PEDRO MIGUEL LOCK 1 Lock Lift 30 Ft.
Miraflores Lake
MIRAFLORES LOCKS Flight of 2 Locks Lift 55 Ft.
Cocoli R.
Rio Grande
Velasquez R.
San Juan Hill 400
NAOS I. BREAKWATER
PERICO I.
FLAMENCO I.
CULEBRA I.
QUARANTINE STA.
Pta. Guinea
CHANGARMI I.
Pta. Batele
Pta. Bruja
TORTOLITA I.
TORTOLO I.
VENADA I.
COCOVI I.
MELONES I.
BAY OF PANAMA
PACIFIC OCEAN
CANAL ZONE
REPUBLIC OF PANAMA
Araijan
PANAMA CANAL ZONE
PANAMA CANAL
PANAMA RAIL ROAD
PANAMA RAIL ROAD (RELOCATED)
Scale of Miles
0 1 2 3 4 5
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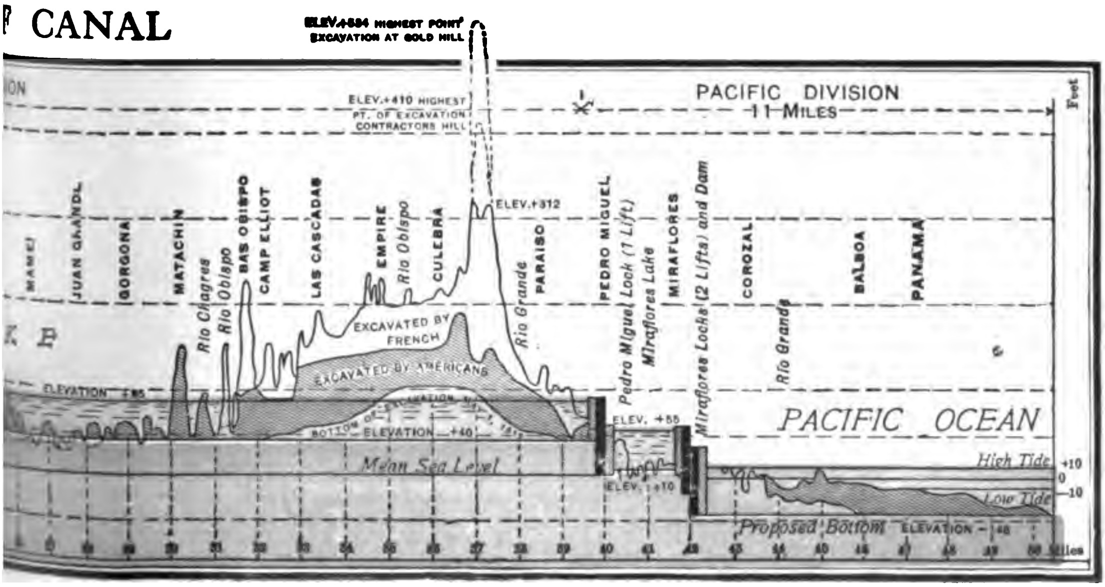
F CANAL


ELEV.+534 HIGHEST POINT EXCAVATION AT GOLD HILL
ELEV.+410 HIGHEST PT. OF EXCAVATION CONTRACTORS HILL
PACIFIC DIVISION
11 MILES
Feet
ELEV.+312
MAMEI
JUAN GRANDE
GORGONA
MATACHIN
Rio Chagres
Rio Obispo
BAS OBISPO
CAMP ELLIOT
LAS CASCADAS
EMPIRE
Rio Obispo
CULEBRA
Rio Grande
PARAISO
PEDRO MIGUEL
Pedro Miguel Lock (1 Lift)
Miraflores Lake
MIRAFLORES
Miraflores Locks (2 Lifts) and Dam
COROZAL
Rio Grande
BALBOA
PANAMA
EXCAVATED BY FRENCH
EXCAVATED BY AMERICANS
ELEVATION +85
BOTTOM OF EXCAVATION ELEVATION +40
ELEV. +55
ELEV. +10
PACIFIC OCEAN
Mean Sea Level
High Tide
Low Tide
+10
0
-10
Proposed Bottom ELEVATION -48
40
41
42
43
44
45
46
47
48
49
50
Miles

life and suffering that results from such measures. During the 10 years of construction, the commission lost by death only 17 out of every 1,000 of the employees. That is, from the whole force of 39,000 men, 663 died each year, and for the whole construction period the loss was 6,630 men. If the sanitary conditions had remained as they had been up to 1904, and the commission had lost, as did the French, 200 employees out of each 1,000 men on the work, that would have made the loss 7,800 men each year, and 78,000 during the whole construction period. It is evident, therefore, that 71,370 human lives were saved by the work of the sanitary department during the building of the canal.

The distinguished author refers to the sanitary work done in the Canal Zone as the first great demonstration that the white man can (or could, if such measures were generally adopted and applied) live as well in the tropics as in the temperate zones.

Lock-Canal Plan Adopted.— The report of the board of consulting engineers was submitted to the Senate Committee on Interoceanic Canals and extended deliberations took place upon the two problems of a high-level lock canal to cost $147,000,000, and not over eight years to build, and a sea-level waterway to cost about $250,000,000 and from 12 to 15 years to build. On 17 May 1906, the majority report of the Senate committee in favor of a sea-level type of canal was submitted by Senator Kittredge. Notwithstanding this report the idea of a lock canal prevailed in the end. On 15 June 1906, Congress in committee of the whole voted in favor of a high-level lock canal by a majority of 110 to 36, and on 21 June the Senate also declared for a lock canal. President Roosevelt signed the bill on 29 June 1906. Thus the long-discussed question was finally settled and work was at once more vigorously entered on. Under the direction of Chief Engineer Stevens commendable progress was made by the early part of 1907. Friction developed, however, between the members of the commission and the Washington authorities, and, in 1907, when it was proposed that the commission should remove from Washington to the zone and do its work on the field of operation instead of at a distance, Chairman Shonts and Chief Engineer Stevens resigned. President Roosevelt then radically reorganized the commission, under date of 1 April 1907. The earlier policy of taking men from civil life to superintend and execute the work was abandoned as a failure. The new commission was made up of government officials and was attached to the War Department under the immediate authority of the Secretary of War. The commission was constituted as follows: Lieut.-Col. George W. Goethals, corps of engineers, chairman; Major David DuB. Gaillard, corps of engineers; Major William L. Sibert, corps of engineers; Rear-Admiral H. H. Rousseau, civil engineer, U. S. N.; Hon. Joseph C. S. Blackburn, Colonel William C. Gorgas, medical department, U. S. A.; and Mr. Jackson Smith. Mr. Smith resigned in 1908, and Major H. F. Hodges was appointed to fill the vacancy. Senator Blackburn resigned in 1909, and was succeeded by Maurice H. Thatcher. The latter resigned in 1913 and was succeeded by Richard L. Metcalf, who served until April 1914, on which date — the canal being then essentially finished — the Isthmian Canal Commission was abolished, and attention given to the organization of an operating force. In the course of the work many details were altered and at the conclusion of the work the canal plan was as follows: sea-level approach channel in Limon Bay 4.5 miles long, 500 feet wide at bottom and 41 feet deep below mean sea-level; straight strip of sea-level canal for 5.5 miles to Mindi where there is a slight bend followed by a straight channel for 1.5 miles to the locks at Gatun, three in number with a combined lift of 87 feet to the summit level of Gatun Lake, favored by the construction of an earth dam of unusual dimensions extending across the valley at Gatun. The flow of the Chagres into the lake is discharged from the latter by a concrete spillway. The normal summit level of the lake is 85 feet, but provisions are made so that the water surface can be carried at any level between 80 and 87 feet, a matter of the greatest importance during the dry season. The locks at Gatun are close together and vessels pass directly from one lock into the next. All three locks are in duplicate, corresponding locks adjoining with only a dividing wall between, making it possible for a vessel to ascend one set, while another vessel descends the adjoining set of locks. Each lock has a usable length of 1,000 feet and a usable width of 110 feet. From the locks at Gatun there was no digging necessary for 17 miles except for an occasional hill-top or mound because of the great depth of the lake. The channel for 3.5 miles from the locks is perfectly straight, with a depth of 75 feet and is 1,000 feet wide. At this point there is a great bend in the canal followed by a straight channel for 4.5 miles to near Bohio, where there is a slight bend. From Bohio to Buena Vista the canal is 1,000 feet wide, after which it again runs

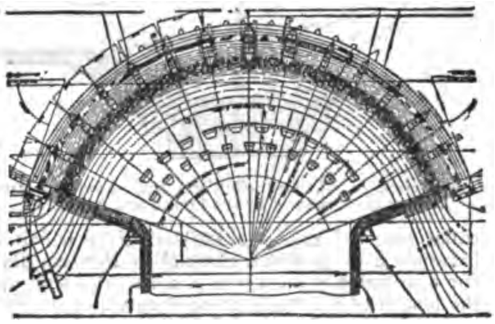


Diagram of spillway, Gatun dam.

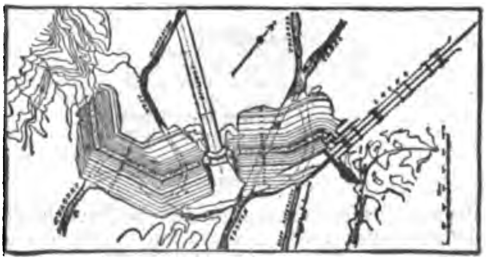
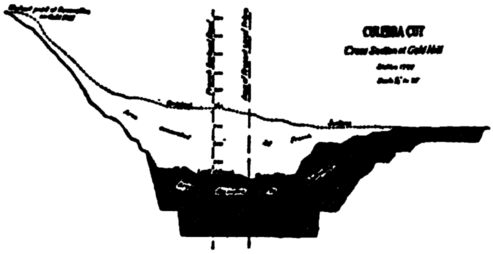
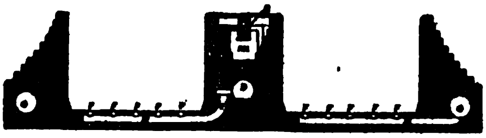


Diagram of the Gatun dam, spillway, and locks.

with only two bends for five miles to Tabernilla. For three miles to near San Pablo the channel width is only 800 feet. The lake narrows past San Pablo and over the site of Gorgona. It retains a width of from 500 to 800 feet to Bas Obispo, where the great Gaillard (Culebra) Cut is entered. For 8.1 miles through the cut the bottom width is only 300 feet, with a minimum depth of 45 feet at normal lake level. The end of the high level is reached at the Pedro Miguel lock, also in duplicate, by which a descent (or ascent) of 30 feet is made to the 55-foot level of Miraflores Lake, 1.30 miles in length, with 500-foot channel and 45 feet in depth. There are two locks in duplicate at Miraflores, with a combined descent (or ascent) of 45 feet at Pacific high tide or 65 feet at low tide, by which tidewater is again reached. The canal runs 2.5 miles to Balboa, after which it becomes a deep water channel in Panama Bay for a distance of nearly five miles. To sum up, the length of the canal from deep water to deep water is 50 miles; length from shore line to shore line, 40 miles; bottom width of channel, maximum, 1,000 feet; bottom width of channel, minimum, in Gaillard Cut (otherwise known as Culebra Cut), 300 feet; locks in pairs, 12; locks, usuable length 1,000 feet; locks, usable width, 110 feet; Gatun Lake, area, 164 square miles; Gatun Lake, channel depth, 45 to 85 feet; Gaillard Cut (Culebra Cut), channel depth, 45 feet; excavation by the French, 78,146,960 cubic yards; excavation by the French useful to present canal, 29,908,000; estimated value to canal of excavation by the French, $25,389,240; value of all French property there, $42,799,826; work begun by the Americans, 4 May 1904: excavation accomplished to 31 March 1915 (when only about 6,000,000 or 7,000,000 cubic yards remained to be excavated in canal proper), 232,440,945 cubic yards; concrete, total for canal, excluding terminals, 4,844,566 cubic yards; time of transit through completed canal, 10 to 12 hours; time of passage through locks, three hours; relocated Panama Railroad, length, 47.11 miles; Canal Zone, area, 436 square miles; canal and Panama Railroad forces actually at work in September 1913, about 37,000 (including about 5,000 Americans); payment to New Panama Canal Company (for the French property), $40,000,000; payment to the Republic of Panama, $10,000,000; estimated total cost of the canal, $375,000,000 (estimate given by General Goethals).



Cross-section of Gaillard (Culebra) cut, showing relative amount of excavation by the French and Americans.



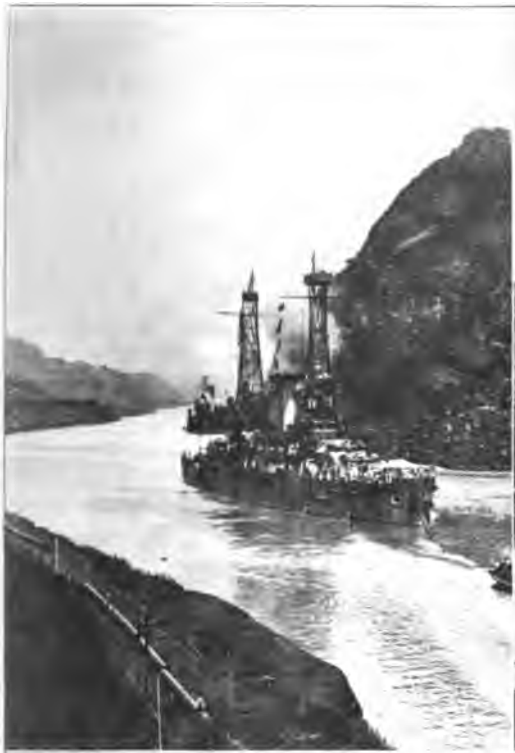
Cross-section of lock chambers and walls at Gatun.
- a. Passageway for operators.
- b. Gallery for electric conduits.
- c. Drainage gallery.
- d. Culvert in centre wall.
- e. Culverts under lock floor alternating with those from sidewalls.
- f. Wells opening from lateral culverts into lock chamber.
- g. Culverts in side walls.
- h. Lateral culverts.

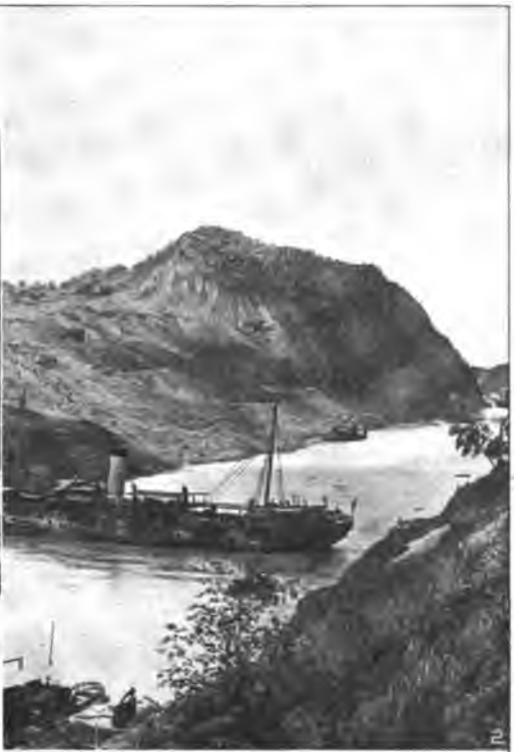
Slides.— The engineers of the canal had to deal with peculiar conditions in the shape of huge masses of earth and rock which slid into the canal excavation both before and since completion. These slides made up 29,431,000 cubic yards of the total American excavation of 232,353,000 cubic yards or 12½ per cent and 30 per cent of the excavation at Culebra. Slides developed where the side slopes of the excavation were left too steep to provide a stable bank. The West Culebra slide involves 68 acres with about 11,000,000 cubic yards of excavation, the East Culebra an area of 55 acres and 8,000,000 cubic yards, and the Cucaracha slide 50 acres and 5,300,000 cubic yards. In September and October 1915 these slides suspended navigation on the canal.

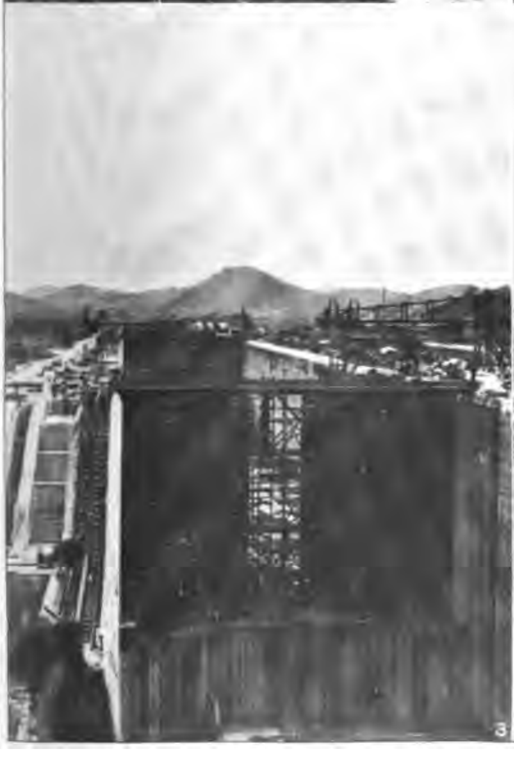
The Canal in Operation.— On 7 Jan. 1914 the self-propelled steamer, the crane boat *Alex. La Valley*, made the first passage of the canal and on 15 Aug. 1914 commercial traffic was inaugurated. On the latter day the steamer *Ancon* made the passage in 9 hours and 40 minutes. The canal has since been in operation, except during the period September 1915–27 March 1916, when the slides interfered with navigation. In the two years ending 14 Aug. 1916, exactly two years from its inaugural opening, 2,097 vessels aggregating 7,046,407 tons passed through, with cargoes aggregating 9,031,613 long tons. In the fiscal year ending 30 June 1917 1,876 vessels made the passage of the canal. These had a net tonnage of 6,009,356 tons and carried 7,229,255 tons of cargo. The tolls collected from vessels passing through the canal from its opening to 1 Jan. 1917 aggregated $9,461,717. In the same period the operating and maintenance charges amounted to $14,717,072, leaving an operating deficit of $5,255,355.

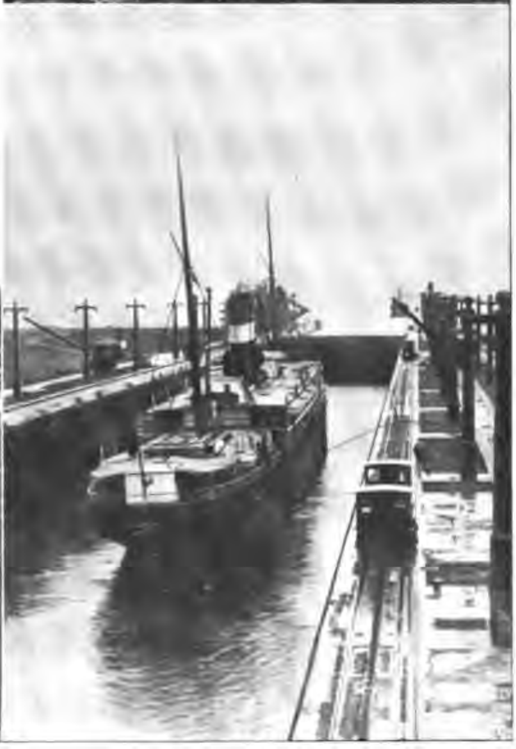
Tolls.— Panama Canal toll rates are the following: (1) On merchant vessels carrying passengers or cargo, $1.20 per cent vessel ton (each 100 cubic feet) of actual earning capacity. (2) On vessels in ballast without passengers or cargo, 40 per cent less than for those of class 1. (3) On naval vessels, other than transports, colliers, hospital ships and supply ships, 50 cents per displacement ton. (4) On army and navy transports, colliers, hospital ships and supply ships, $1.20 per net ton, the vessels to be measured by the rules that are also employed in determining the net tonnage of merchant vessels. In time of war, as at other times, the canal may be used by all navies, according to treaties now in force which provide that it "shall be free and open to the vessels of commerce and war of all nations and shall never be blockaded, nor shall any right of war be

PANAMA CANAL









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1 Battleship Ohio Passing through Culebra Cut, out toward Pacific
2 Turning a Ship around in Culebra Cut
3 Looking North from West Terminal, Miraflores, showing inclines from lower to upper locks
4 Steamship Panama in Upper Chamber, Gatun Locks, Gatun Lake

exercised nor any act of hostility be committed within it.»

The Canal in its Relation to International Commerce.—An interesting and valuable study of the effect of the canal upon international trade competition, by Mr. Hutchinson (see *Bibliography*), contains the following reference to new opportunities created by the cutting of this canal: «A vast region bordering the Pacific, with huge population and enormous resources, crying out for economic development, is being brought into a new relationship with the older economic sections of the world best able to aid them in the fulfilment of their desires.» The author says truly that many Pacific countries need European and American capital, need immigrant population, need the stimulus and direction of American or European enterprise. Their latent resources cannot be developed fully in the absence of transportation facilities, railways, roads, harbor and street improvements, modern sanitation, public works of all sorts. Their industries need the introduction of modern equipment and methods. In brief, the Atlantic must supply the Pacific. With the opening of the Panama Canal, a new facility of intercourse has been created. Goods, tourists, agents, mails, emigrants, can now reach many of the Pacific countries more quickly and conveniently. New growth of economic, commercial, social and intellectual intercourse inevitably follows. The geographical position of the canal and the trend of development in the Pacific countries, as the writer points out, are such that the eastern portions of the United States are most favorably situated to play a part in this new growth. With reference to many Pacific regions the industrial eastern part of the United States has hitherto been at a disadvantage compared with Europe; but the handicap is either converted into an advantage by the canal, or greatly reduced. In those regions where the United States has already held some advantage, her position is greatly strengthened by the facilities offered by the new route.

Bibliography.— Bakenhus, R. E., Knapp, H. S., and Johnson, E. R., ‘The Panama Canal’ (New York 1915); Bullard, A., ‘Panama, the Canal and the People’ (rev. ed., New York 1914); Goethals, G. W., ‘Government of the Canal Zone’ (Princeton 1915); id., ‘The Panama Canal — an Engineering Treatise’ (New York 1916); Gorgas, W. C., ‘Sanitation in Panama’ (New York 1915); Hutchinson, L., ‘The Panama Canal and International Trade Competition’ (ib., 1915); Nixon, Lewis, ‘Canal Tolls and American Shipping’ (New York 1914); Oppenheim, L. F. R., ‘The Panama Canal Conflict between Great Britain and the United States of America’ (Cambridge 1913); Sibert, W. L., and Stevens, J. F., ‘The Construction of the Panama Canal’ (New York 1915). For the details of the work, engineering problems, sanitation rules, zone police, etc., consult files of the *Canal Record*, official journal of the Isthmian Canal Commission (Ancon 1907 et seq.).

JOHN B. MCDONNELL,
Editorial Staff of The Americana.

PANAMA CONGRESS, a congress of representatives of various American nations held at Panama, June 1826, for the discussion of matters of interest to the American peoples. The meeting was originally intended only for South and Central American delegates, but the ministers of Mexico, Colombia and Guatemala at Washington formally invited the United States to be represented. After some friction in congress two delegates were appointed, but at the congress 22 June 1826 the American delegates were not present, one having died en route and the other having been delayed in transit. Chile and Brazil approved of the congress but did not send delegates. Ten sessions were held.

PANAMA-PACIFIC INTERNATIONAL EXPOSITION. See SAN FRANCISCO — PANAMA-PACIFIC INTERNATIONAL EXPOSITION.

PANAS, Photinos, French surgeon and ophthalmologist: b. in Cephalonia, one of the Ionian Islands, 30 Jan. 1832; d. 1903. After an elementary course in medicine at Corfu, he went to Paris, where in 1860 he was graduated from the School of Medicine. Three years later he became a naturalized citizen of France and was then appointed associate professor and surgeon to the Central Bureau. In 1864 he became ophthalmic surgeon to the Bicêtre hospital, in 1865 to the Midi and Lourcine hospitals, in 1868 to the Saint Louis and Saint Antoine hospitals, in 1872 to the Lariboisière hospital, and in 1877 to the Hôtel Dieu. In 1879 he was appointed professor of clinical ophthalmology in the Ecole de Médicine. Panas rendered valuable service in the Franco-Prussian War and achieved some renown through his introduction into France of Lister's methods and by his operations in ovariotomy. He was more widely known, however, for his writings in medical journal on subjects connected with his specialty, and for his works on ophthalmology, the most important of which are ‘Leçons sur le strabisme,’ etc. (Paris 1873–93); ‘Leçons sur les kératites’ (1876); ‘Leçons sur les affections de l'appareil lacrymal’ (1877); ‘Leçons sur les rétinites’ (1878); ‘Anatomie pathologique de l'œil,’ with Remy (1879); ‘Sur le glaucome et les néoplasmes intraoculaires’ (1893); ‘Traité complet des maladies des yeux’ (1894); ‘Leçons de clinique ophthalmologique’ (1899), etc.

PANATHENÆA, Greek festivals, celebrated at Athens in honor of Athena. The Panathenæa were distinguished into the greater and the less, in both of which three kinds of games were exhibited, conducted by 10 presidents. On the first day were races with torches in the Ceramicus; on the second, gymnastic exercises and imitations of naval fights; on the third, contests of music and declamation, and dramatic representations. An olive crown from the groves of Academus and a vessel full of sacred oil were the rewards of the victor. Then followed the sacrifices and the sacrificial feasts.

PANAY, pä-nī', Philippines, the most northwestern island of the Visayan group, lying a little to the southeast of the centre of the archipelago, bounded on the east by Iloilo Strait, and on the west by Mindoro Sea; area 4,611 square miles. The largest of its dependent islands is Guimarás (243 square miles), lying to the southeast of Panay.

Topography.— The shape of the island is roughly triangular. A mountain range extends from the peninsula of Buruanga in the northwest to the extreme south and from Maymagui

Mountain, in the centre of this range, another mountain system extends to the east and north. The island is thus naturally divided into three provinces. There are three large rivers, the Panay, Jalaur and Aclán, and numerous smaller streams. The coast on the east and north is well indented with bays and harbors.

Industrial Resources.— The chief industry of Panay is agriculture; cotton, corn, chocolate, pepper, coffee, tobacco, sugar, rice and copra are raised; the last three are the staple crops, and of excellent quality. There are also large numbers of livestock raised, cattle, carabao and horses, excellent grazing lands being found in all parts of the island. The horses raised in the province of Iloílo are very highly prized throughout the archipelago. The forests are valuable; among the more important woods are molane, ebony and sibucao, large quantities of which are exported; honey, wax and pitch are also gathered in considerable quantities. The mineral resources have not been scientifically developed; gold is found and is mined in small quantities; and fine marbles and tonalite are quarried to some extent; there are deposits of gypsum, marl and iron; quicksilver and copper are also reported. The mechanical industries are well advanced and produce for export; fine fabrics of pineapple fibre, jusi, sinamay and cotton are manufactured; also sugar sacks, hats and palmleaf baskets; the woven fabrics of the province of Antique are especially well known, the looms giving employment to over 12,000 women; lime of good quality is manufactured in Iloíla. The fisheries are also valuable, particularly those of the island of Guimarás. Within the three provinces there are excellent road systems; but as the mountains are almost impassable the trade between provinces is entirely by sea; there is also a large foreign trade, the town of Iloíla (pop. 60,000) being next to Manila in commercial importance.

People and History.— The people of Panay are almost entirely of Visayan race; a few thousand wild Mundos and a few Negritos live in the mountains. This island was a stronghold of the Filipino insurrection; it was first occupied by United States troops in the early part of 1899 but the island was not completely pacified until January 1901. The island was divided into three provinces (in accordance with the natural divisions), Antique, Cápiz and Iloíla; the former Spanish commandancia of Concepcion was consolidated with Iloílo. Pop. of island, 743,646.

PANAY, Philippines, a pueblo of the province of Cápiz, island of Panay, situated a few miles inland from the northern coast, three miles southeast of Cápiz, the provincial capital. Pop. 15,500.

PANAY RIVER, a river of the province of Cápiz, island of Panay, rises on the eastern slopes of the Tapas Mountains, flows north and empties into the sea near the town of Cápiz; length, 38 miles. It is one of the most important rivers of the island of Panay, has five chief tributaries, and drains the greater portion of the province of Cápiz. It has a high-tide depth of 13 feet at its mouth and is navigable for large native craft for a considerable distance.

PANCHATANTRA, păn-chạ-tăn'trạ, an old collection of apologues and stories in Sanskrit. Vishnusarman is represented as the narrator of the stories and author of the book. The Panchatantra has been frequently revised. Wilson had three widely varying manuscripts before him while he drew up his analysis of the work. Kosegarten, who first edited the Sanskrit text, used 11 varying manuscripts. In these he recognized two versions, one simple, the other more extended and elaborated. Neither of these can be the first form of the work, which must have been a still more ancient text.

Some of the apologues contained in the Panchatantra occur in the Mahabharata, others originate in Buddhist books, and several abridgments or imitations occur elsewhere in the Sanskrit.

The 'Panchatantra' is one of the works styled in India as 'Nitishastras' (*shastra,* "book of knowledge," and *niti,* "conduct"), written for the instruction of kings and all those called to take a share in the government. The five books of which it is made up form as many distinct sections related to each other by a preface in which a king, after taking the advice of his councillors, entrusts to a Brahman the training of his three sons. The Brahman composes the Panchatantra for the edification of the young princes and by the reading of that work he succeeds in overcoming their idleness and in developing their minds.

The first book has for its title 'Mitrabheda' ('The Disunion of Friends'). It aims at acquainting kings with the danger incurred by lending ear to the insinuations of those who seek to sow divisions between a prince and his faithful subjects. The second book, 'Mitraprapti' ('The Acquisition of Friends'), shows how advantageous it is for men to unite and help each other. The third book, 'Kakolukiya' ('The War of the Crows and the Owls') demonstrates the danger of trusting to untried men or to enemies. The fourth, 'Labdhapranasana' ('The Loss of Acquired Good'), proves that we frequently lose by imprudence what we had acquired with difficulty. The fifth and last book, 'Aparikshitakaraka' ('Inconsiderate Conduct'), shows the danger of being precipitate. The narrative is interspersed with sentences, maxims, thoughts, extracts from legal codes, poems and dramas. Consult Frazer, 'Literary History of India' (1896); Kosegarten, 'Pantchatantrum' (1848-59); Lancereau, 'Pantchatantra,' French version (1871); Schmidt, 'Pancatantra, Textus Ornatior,' German version (1901).

PANCOAST, Henry Spackman, author and educator: b. Germantown, Pa., 24 Aug. 1858. He was educated at Germantown Academy and by private tutors. Studied law, admitted to the bar in 1882 but retired from practice in 1887 to devote himself to writing and teaching. Received degrees of L.H.D., Trinity, 1912; A.M., University of Pennsylvania, 1913. Author of 'Representative English Literature' (1892); 'Introduction to English Literature' (1895, 3d ed. 1907); 'Study Lists, Chronological Tables and Maps' (1908); 'Introduction to American Literature' (1898; revised ed. 1911); 'A First Book of English Literature' (with P. V. D. Shelly; 1911); 'Standard English Poems' (1900); 'Standard English Prose' (1902); 'Early English Poems' (with J. D.

Spaeth; 1911); ‘A Vista of English Verse’ (1911); ‘English Prose and Verse’ (1915). Also monographs on questions of Indian Rights and contributions to magazines.

PANCOAST, Joseph, American surgeon: b. Burlington, N. J., 1805; d. 7 March 1882. In 1828 he was graduated at the University of Pennsylvania and began teaching surgery in 1831. For a long period he was connected with various hospitals in Philadelphia; was professor of surgery in the Jefferson Medical College from 1838 to 1847 and professor of anatomy from 1847 to 1874. He resigned in the latter year, becoming professor emeritus, and was succeeded by his son, William H. Pancoast. He was a remarkably skilful operator, devised many improved methods, and made some important discoveries. Besides contributing to leading medical journals, he translated and edited various works, and published ‘A Treatise on Operative Surgery’ (1844; 3d ed., 1852) and ‘A Treatise on the Structure, Functions and Diseases of the Human Sympathetic Nerve’ (1831).

PANCOAST, William Henry, American surgeon: b. Philadelphia, 1835; d. 1897. In 1856 he was graduated at the Jefferson Medical College and subsequently studied in London, Paris and Vienna. He established his practice in Philadelphia and during the Civil War was superintendent of a hospital there. He joined the faculty of Jefferson Medical College in 1867 and in 1874 succeeded his father as professor of surgery there. In 1887 he was one of the founders of the Medico-Chirurgical College of Philadelphia, where he became professor of anatomy and clinical anatomy. Dr. Pancoast published a report in 1884 concerning the anatomy of the Siamese twins, which attracted wide attention.

PANCRAS, Saint, or PANCRATIUS («Victor in every game») a christian martyr, who at the age of 14 defied the decree against Christianity issued by Diocletian and was accordingly put to death (304). He is regarded as the patron saint of children and there are many churches dedicated to him in England, Italy, France and Spain, and his festival is celebrated on the anniversary of his death (12 May).

PANCREAS, păn'krē-ăs. The pancreas *παν-χρεας* (all flesh) is a large abdominal gland which has the double purpose of producing a digestive secretion which is poured into the upper part of the small intestine (duodenum), and of regulating the utilization of sugars and starches in the body. The latter function is carried on by an internal secretion which passes directly into the blood. The pancreas of the calf is used for food under the name of the «stomach sweetbread,» in distinction to the «neck sweetbread,» which is the thymus gland. In man the organ is irregularly prismatic in shape, is reddish-yellow in color, and lies with its long axis across the posterior wall of the abdomen behind the stomach at the level of the first and second lumbar vertebræ. It has been variously compared in shape to a hammer, to the letter «J» placed on its side, or to a dog's tongue. The right-hand end is the larger and is termed the head. A slightly narrower portion connects the head with the body of the gland which in turn terminates in an elongated portion called the tail. The average dimensions of the gland are six to eight inches (15 to 20 centimeters) in length, one and a half inches (three and a half to four centimeters) in breadth, and one-half to one inch (one and a half to two centimeters) in thickness. In weight it averages two to three and a half ounces (60 to 100 grammes). The head of the organ lies just to the right of the vertebral column, and is encircled by the loop formed by the duodenum as it leaves the pyloric end of the stomach. The body extends to the left behind the stomach, and the tail usually touches the hilum of the spleen. Unlike the other abdominal organs the pancreas does not have a special artery from the aorta, but derives its blood supply through the branches from the celiac axis and the superior mesenteric artery. Its nerve supply comes through the branches of the celiac plexus, which are non-medullated, but provided with ganglia, and penetrate to the ultimate structural units of the organ, which they surround in fine networks. The gland pours its external secretion into the duodenum through a long duct (duct of Wirsung) running from left to right the length of the organ. It begins through the union of small ducts from the lobules in the tail and, increasing in size through the receipt of numerous tributaries, as it proceeds, finally reaches the head of the gland. On leaving the pancreas it joins the common bile duct, and together with this, passes obliquely through the wall of the second part of the duodenum three or four inches (8 or 10 centimeters) from the stomach, usually at the summit of a little elevation of the mucous membrane, called the papilla of Vater. It may, however, empty into the bile duct itself a short distance from the intestine. A second duct, the duct of Santorini, is usually subsidiary to the main duct and may empty into the duodenum by a separate opening a short distance above the papilla of Vater, or it may connect with the main duct. Sometimes it is of large size and may serve as the chief excretory duct of the gland. Anomalies of the pancreas are occasionally seen, such as division of the organ into two parts connected by a thin bridge of gland substance containing the duct, or an accessory pancreas may be found in one-half to one per cent of the cases. This is a mass of gland tissue with a duct opening into the alimentary canal and lying in the wall of the stomach, duodenum, or other portion of the small intestine. In the embryo the pancreas is developed from two distinct entodermal outgrowths from the wall of the duodenum and the junction of the bile duct with the duodenum respectively, spoken of as dorsal and ventral buds, the latter of which is double. The dorsal portion, which is much larger than the ventral, forms the body and the tail of the gland, and also a part of the head. It contains the duct of Santorini, but the larger part of the dorsal pancreatic duct joins the duct of the smaller ventral pancreas and gives rise to the main excretory canal of the gland, the duct of Wirsung. In structure the pancreas resembles the parotid gland, and for this reason is sometimes termed the abdominal salivary gland. It belongs to the group of tubulo-racemose glands and consists of groups of secretory cells or lobules held together by a stroma of loose connective tissue, which also carries the ducts, vessels and nerves of the organ. In the lobules two types of cells may be distinguished, the secreting cells, which make up the bulk of the organ, and groups of cells of a different type found in the centre of the lobules, which were first described by Langerhans in 1869, and are called pancreatic islands. The secreting cells, when at rest, contain coarse granules which disappear when the gland is actively secreting. The islands of Langerhans, which vary in size from a few cells to several millimeters in diameter, develop from the smaller ducts after the gland has attained a considerable degree of development in the embryo. They are composed of spheroidal or polygonal cells, distinct in appearance from the secreting cells, and produce an internal secretion which is discharged directly into the blood vessels. The external secretion, or pancreatic juice, plays an important part in the digestion of proteins, fats and carbohydrates (see article Digestion). It is a clear, alkaline fluid of which it is estimated that from 16 to 26 ounces (500 to 800 cubic centimeters) a day are secreted. Its most important constituents are three enzymes, or their preliminary forms, called zymogens, namely a protein-digesting enzyme, called trypsin, a starch-digesting enzyme called amylopsin, and a fat-digesting enzyme called steapsin (lipase).

The mechanism of secretion is supposed to be as follows: When food leaves the stomach and enters the duodenum, the acid of the gastric juice produces from the mucous membrane of the intestine a substance called secretin. This is absorbed by the blood and is carried to the pancreas which it stimulates to activity, though the secretion is also to some extent under the control of the secretory fibres of the vagus and splanchnic nerves. The pancreas furthermore produces an internal secretion which is apparently formed by the cells of the pancreatic islands. This is thought to be essential for the proper metabolism of sugar in the body, and in diabetes (see article Diabetes) these portions of the gland usually show more or less degeneration or shrinkage. The view now held is that sugar exists normally in the body in a combined form, but that in diabetes this power of combining is to some extent lost and the combining substance which forms the bond between the tissues and the sugar is supposed to be supplied by the cells of the pancreatic islands. Besides the changes observed in diabetes, there are numerous other forms of disease of the pancreas. Among these may be mentioned acute or chronic inflammatory changes (pancreatitis), cysts and tumors. Of the latter, cancer is one of the commonest, and is generally secondary to a similar growth in the stomach. The symptoms of these conditions comprise pain (usually high up in the abdomen), digestive disturbances, the passage of bulky, light-colored, fatty stools, jaundice, loss of weight, etc. A characteristic manifestation, known as fat necrosis, is sometimes seen in which as the result of the escape of pancreatic secretion into the surrounding fatty tissue areas of necrosis develop owing to the action of the fat digesting ferment.

PANCREATIN, a substance secreted by the pancreas, and often administered in medicine for the correction of certain digestive disorders. The commercial supply that is used in medicine is mostly obtained from the pancreas of the hog, and is best known in the form of a grayish, amorphous powder, usually with a tinge of yellow, and with a faint, characteristic smell. Pancreatin is not a definite chemical substance, but contains several distinct ferments. Its composition varies, moreover, with the source from which the substance is prepared, and with the state of activity of the particular pancreas from which it is extracted. One of its normal components, steapsin, is an exceedingly powerful agent for effecting the emulsification of fats, and it is even able to partially separate them into free glycerin and free fatty acids. Another constituent, trypsin, converts coagulated albuminous substances into soluble peptones, resembling pepsin in this respect, although its action is somewhat different. Pancreatin, for example, is effective only in an alkaline medium, while in the case of pepsin the medium must be acid. Another constituent, amylopsin, converts starches and other amylaceous substances into sugars; and a fourth ferment that is present possesses the power of coagulating the casein of milk.

PANDA, or WAH, an animal (*Ælurus fulgens*) of the raccoon family, which inhabits the eastern Himalayas to a height of about 12,000 feet. It is equal in size to a large cat, and has remarkably glossy reddish-chestnut fur, darker below, with a white face and a long ringed tail. It seems to be the remnant of a once very widespread group which in the early Tertiary Period was numerous in Europe, explaining the present curious distribution of the family, for all other existing raccoons are American. The animal is described as inhabiting forests and feeding almost entirely on vegetable food; but it eats eggs and insects when it can get them. Most of its time is spent upon the ground, but it has semi-retractile claws and is able to climb trees. It is said to be rather a dull-witted, defenseless creature, reminding one of the kinkajou. Consult Flower and Lydekker, 'Mammalia' (1891); Blanford, 'Fauna of British India: Mammals' (1888).

PANDAN, pän-dăn', Philippines, a pueblo of the province of Antique, island of Panay, on the west coast near the Bugang River, 66 miles north of San José de Buena Vista. It is on the coast road and has a good anchorage ground. Pop. 13,800. There is a small pueblo of the same name (pop. 2,143) on the north coast of Catanduanes Island, near Albay, Luzon.

PANDANUS. See Screw-pine.

PANDARUS, păn'dạ-rŭs, Trojan hero, son of Lycaon. He was given by Apollo a bow with which he became famous as an archer. In the war between the Greeks and Trojans he broke the truce, and after wounding Menelaus and Diomedes was slain by the latter. He also appears in Shakespeare's 'Troilus and Cressida' as a procurer, whence the English word "pander."

PANDAVAS, pän'dạ-vạz. See Mahábhárata

PANDECTS, The, the most important compilation of the Roman law, prepared by several scholars at the order of the Emperor Justinian (q.v). It is also called 'The Digest.' It was an attempt to form a complete system of law from the commentaries of the great jurists. The work was done by a committee composed of the jurist Tribonianus and 16 others learned in law; it was begun in 530 A.D. and completed in 533. The magnitude of the task becomes apparent from the fact that about 2,000 various treatises were consulted, and from these about 9,000 extracts appear. One-third of them comes from Ulpian, one-sixth from Paulus, one-twelfth from Papinianus, and the rest from 36 other writers. The Pandects, with the Codex Justinianus, became the law for the Roman Empire. When the Lombards invaded Italy in 568, they overturned almost all the few remaining Roman institutions, the law courts among them. In Ravenna, however, the Roman law was still taught; and the Lombards allowed their Roman subjects to be judged according to the Roman law. The Codex, which begins with an invocation to the Trinity, and contains a great deal of legislation on ecclesiastical matters, was held in esteem by the clergy; but the Pandects were at first ignored as being the work of pagan jurists. In the last part of the 11th century, however, there was a great revival of the study of Roman law. Irnerius of Bologna, the greatest teacher of his time, renewed the study of the Pandects, which, together with the Codex, became the basis of all mediæval legislation. The Pandects may justly be considered the most famous collection of law ever made. In both its central idea of codification and its content and phraseology it has profoundly influenced subsequent legislation, including that of New England and the United States.

PANDORA, *in Greek mythology,* the first woman; so called because she received gifts from all the Olympians. She was the creature of Prometheus, and the gods came down to see her and conferred their gifts on her. Athena instructed her in all works of female skill. Aphrodite endowed her with beauty and fascination. Hermes inspired her with a desire of pleasing, and taught insinuating words. Athena carried her thus equipped into the assembly of the gods, and all admired the work. She became the wife of Epimetheus, a mortal, brother of Prometheus, and brought sorrow into the world by opening, in her curiosity, a box containing the blessings of life; all these escaped, save Hope. This is clearly a late and philosophic addition to the myth.

PANDOURS, păn'doorz, or **PANDOORS,** the name formerly given to the Servian or Raitzian irregular foot-soldiers coming from the village of Pandur, in the county of Sol, in Lower Hungary, who in 1750 were made regular troops. The term is now used in Hungary and Croatia for mounted constabulary or guards.

PANEL, (1) *in law,* a schedule, or roll of such jurors as the sheriff returns to pass upon any trial; and impaneling a jury is returning their names in such schedule of parchment. In Scottish law the prisoner at the bar is the panel. (2) *In carpentry,* a tympanum or square piece of thin wood, sometimes carved, framed or grooved in a larger piece, or between two upright pieces and two cross pieces. (3) *In masonry,* a face of hewn stone. (4) *In bookbinding,* a depressed part of the sides within a relatively elevated bordering portion; or a space on the back between bands. (5) *In mining,* a system of coal mining in which the projected winning is divided into large square allotments, divided by massive walls of coal, instead of placing the whole working in one undivided arrangement. The pillars are left very large, the room small; the pillars are worked out, props being substituted; these are knocked out, and the goaf filled up by the caving down of the ceiling. (6) *In painting,* a piece of wood — oak, chestnut or white poplar — on which, instead of canvas, a picture is painted. The earliest paintings in oil were generally executed on panels, which were composed of various pieces of wood, cemented together with cheese glue; and this glue, or cement, caused each portion to adhere so firmly that such panels were considered stronger than those which consisted of one piece of wood only.

PANGASINÁN, pän-gä-sē-nän', Philippines, a province of the Island of Luzon, in the western central part of Northern Luzon at the head of the Gulf of Lingayen; length, east and west, 56 miles; width, 33 miles; area, 1,316 square miles. The province is mountainous in the northeast, and also near the western boundary; the rest of the surface is flat, sloping toward the sea, and near the coast is very low and frequently inundated by the rivers. There are numerous rivers, of which the Agno is largest and most important. The staple crop is rice, though this is often injured by floods; sugar, corn, tobacco and cocoanut are also abundantly cultivated; the nipa palm grows luxuriantly. There are abundant deposits of salt, and also gold, copper, iron, magnetite and sulphur. The important industries beside agriculture include the making of nipa wine, the weaving of buri and manufacture of mats, hats and sacks, and boat building. The Gulf of Lingayen affords excellent commercial facilities; the commerce is carried on almost wholly by the Chinese. Many of the rivers are navigable for some distance; well constructed roads extend all over the province, and the Manila and Dagupan Railroad also crosses the province. Pop. 343,686, mostly Pangasináns.

PANGASINÁNS, a group of tribes of the Philippine Islands inhabiting the province of Pangasinán, Luzon and some localities in the province of Zambales, Nueva Ecija and Benguet. They are of the Malay race, and at the time of the arrival of the Spaniards had a civilization and written language of their own. Their language is now generally spoken in the province of Pangasinán. They are Christians.

PANGE LINGUA GLORIOSI CORPORIS MYSTERIUM, the first line of one of the finest of mediæval hymns, composed by Saint Thomas Aquinas (d. 1274) for the Office of Corpus Christi. The metre and the opening line are imitated from Venantius Fortunatus, and the poem itself consists of six stanzas of three lines each with triple rhyme in the middle and at the end. In the Roman Breviary, however, it is divided into stanzas of six lines each by halving each of the original lines. This hymn is sung in the solemn procession to the Repository on Maundy Thursday, also in the procession of Corpus Christi and of the Forty Hours Devotion. Stanzas 5 and 6 (stanza 6 forms the doxology) are sung as a special hymn (Tantum Ergo) and prescribed for the Benediction of the Most Blessed Sacrament. Critics have been unanimous in their praise of this work of Saint Thomas. Pimont says that the alternating triple rhyming is a new feature in mediæval hymnody. Neale declares that "this hymn contests second place among those of the Western Church with the 'Vexilla Regis,' the 'Stabat Mater,' the 'Jesu dulcis memoria,' . . . and one or two others, leaving the 'Dies Iræ' in its unapproachable glory." Duffield goes farther and says that "it excels all these" in "its peculiar qualities, its logical neatness, dramatic precision, and force of almost argumentative statement." Translations of this hymn have not been many or felicitous (consult the 'Dictionary of Hymnology'), the best ones perhaps being those of Wackerbarth, Caswall, Neale and Donahoe. A fine rhymed translation, preserving the metre of the original, was published with the text and notes by Hugh T. Henry in the *American Ecclesiastical Review* (March 1890).

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PANGE LINGUA GLORIOSI PRÆLIUM CERTAMINIS, the first line of a hymn generally credited (e.g., by Dreves, Mearns and others) to Venantius Fortunatus (6th century), although sometimes ascribed (e.g., by Gerbert, Bähr Pimont) to Claudianus Mamertus (5th century). In the manuscripts, several of which go back to the 8th century, the hymn contains 10 stanzas (excluding the closing stanza or doxology) of three lines each (tetrameter trochaic catalectic unrhymed). In the Roman Breviary, the hymn is assigned to Passion Sunday and ferial offices from then to Wednesday in Holy Week, also to feasts of the Finding of the Holy Cross, of the Exaltation of the Holy Cross, of the Crown of Thorns and of the Five Wounds. In this Breviary, the hymn is divided into two, the first five stanzas being said at Matins, the second five at Lauds; and each line is subdivided into two so that the stanza contains six lines. The entire hymn is sung on Good Friday during the Adoration of the Cross, immediately after the "Improperia" or "Reproaches." This hymn, like the "Vexilla Regis," suffered many emendations (e.g., "lauream" was substituted for "praelium" in the first line) at the hands of correctors of the Breviary under Urban VIII. The corrected form remains to-day in the Roman Breviary. The more notable translations (consult the 'Dictionary of Hymnology') are those by Aylward, Caswall, Campbell and by Neale. A fine translation, preserving the metre of the original, was published with the text and notes by Hugh T. Henry in the *American Ecclesiastical Review* (March 1891).

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PANGENESIS, a theory advanced by Darwin to account for the phenomenon of heredity, and especially to explain the (alleged) inheritance of acquired characters (effects of use and disuse of parts) which formed the basis of the theory of evolution of Lamarck. (See LAMARCKISM). The problem was to form a hypothesis by which changes in any part of the body could so affect the germ-cells that the parental peculiarities should reappear in succeeding generations. Darwin supposed that every cell of the body gives off at every stage of its existence minute particles, or gemmules, which when furnished with proper nutriment will give rise to parts similar to those from which they were derived. These gemmules are collected from every part of the body to form the sexual elements, and their development in the next generation forms a new being. To explain the fact that characters may skip a generation, he assumed that the gemmules may lie dormant for a time. This theory was weak in that it assumed the existence of particles of which we have no other evidence, and it was shortly disproved by Galton. If these gemmules are constantly given off they must be carried by the blood, and hence if introduced into another animal they must affect the progeny. Galton introduced into the blood of silver-gray rabbits the blood of rabbits of other colors, in some cases to the extent of half the blood, but the offspring invariably showed no trace of change of color. Brooks in his 'Heredity' (1883) modified the theory so as to avoid Galton's experiment, but the theory has been dropped in later years, and has only a historic interest. Consult Darwin, 'Variation of Animals and Plants under Domestication' (1868), and the authorities mentioned under HEREDITY.

PANGO-PANGO, păng'gō-păng'gō, or **PAGO-PAGO**, a harbor on the south coast of the island Tutuila, Samoa. It is L-shaped, with the greatest length (17 miles) from east to west. It is land-locked, and in every way one of the finest harbors in the Pacific. It was ceded to the United States as a naval and coaling station in 1872, and the cession was confirmed by a treaty signed in 1878, by which the United States was given the right to establish at the harbor a station for coaling, naval supplies, freedom of trade, commercial treatment as a favored nation, and extra-territorial consular jurisdiction. It was occupied by the United States in 1898, with the purpose of utilizing its advantages as a coaling and supply station; and by the agreement of 1899, the island of Tutuila came into the possession of the United States. See SAMOAN ISLANDS.

PANGOLIN, or SCALY ANT-EATER. See MANIS.

PANGUTARÁN, păng-oo-tä'rän, a group of small islands of the Sulu Archipelago, lying in the Sulu Sea, south of the Philippines and 100 miles or more northeast of Borneo. The group includes 13 islands of which the two largest are Pangutáran, 44 square miles, and Panducan, 14 square miles; the area of the whole group is 72½ square miles. The islands are moderately high, and are very heavily wooded. The chief industries are fishing and agriculture which is carried on in the rudest and most primitive manner. The island of Pangutáran is low and level; it is thickly populated and carries on a considerable trade with Sulu.

PANHANDLE, The, a long, narrow strip of land, resembling the handle of a pan, generally projecting from a State or Territory, as the Panhandle of West Virginia, or the Panhandle of Idaho. There is also a well-known projection in Texas called the Panhandle.

PANIC, in finance, and commerce, a period of numerous business failures and reduced values, causing loss of confidence by the public, and denoting insecurity and danger to money values and credits. When a panic occurs the banks are besieged by depositors, money is hoarded and general financial distrust ensues. The most noted financial panics since 1750 were as follows:

1763. Amsterdam. Heavy failures in Holland, England and Hamburg.
1773. Holland. Failures exceed $50,000,000.
1793. England, owing to French war. Government issued $25,000,000 Exchequer bills.
1799. England. Panic at Liverpool. Government lent $2,500,000 in Exchequer bills on goods. Eighty-two failures at Hamburg.
1814. England. 240 banks stopped payment.
1825–1826. England. 770 banks stopped payment owing to failure of South Sea bubble companies. Owing to the distress occasioned by the consequences of this panic, families in Yorkshire were reduced in 1829 to live on bran. From the same cause about 200,000 families emigrated to the Continent, America, etc., in four years.
1831. Calcutta. Failures, $75,000,000.
1837. United States. "Wild Cat" crisis.
1847. England. Owing to excessive railway speculation. Failures, $100,000,000. Discount rate, 13 per cent.
1857. United States. Failures $555,000,000. Minor crisis in England.
1866. London. Owing to over-speculation. Total failures above $500,000,000. The last of the serious panics.
1873. United States. Heavy failures in New York and elsewhere.
1884. Grant and Ward and Marine Bank failures.
1885. London. Much temporary disturbance owing to expected Russian war.
1890. London. Baring crisis. Liabilities guaranteed by English banks.
1892. Financial crash in Australia.
1893. United States. The silver crisis, also by some attributed to fear of changes in tariff by the Democratic party.
1907. United States. Crisis brought about by reckless speculation and improper management of financial institutions.
1914. Worldwide, due to the war.

Financial panics and their causes have been the subject of interminable discussion, controversy and theory. They occur with a degree of regularity, and appear to follow certain rules. While undoubtedly artificial, growing out of the established monetary systems and methods of credit, yet once a panic is on, it seems to have to run its course, and business men and financiers shape their affairs to meet the conditions. One of the theories of regularly recurring panics is under-consumption, growing out of the fact that in modern business the money has to go through the pay-rolls to be spent and returned to the banks, and since profits are taken off most transactions, it follows that all of the money is not returned to circulation, and this scarcity of money tends to increase, and after some years hard times and panic follow. Another theory is the changing value of gold, on which we base all financial transactions. Increased production of gold may or may not keep pace with increased commerce and commercial activity, and when a disproportion develops some people suffer, and panic ensues. Alternate inflation and contraction of currency seems a sure cause of financial panic. Banks are allowed to issue paper money under certain conditions safeguarding the public; they issue much more than can be redeemed in coin. There is further inflation by checks and notes, until it has been customary to report banking deposits as five or six times the total coin in a country. Then something happens to tie up a lot of money, and everybody is short, and postpones paying bills, so that weak business houses fail and drag down others with them; a period of contraction has set in; stocks tumble in value; speculations push them further down; rentals reduce and real estate values fall, wages and prices are lowered and several years of hard times usually follow. The doing of large business through stock companies, whose securities constitute a convenient form of investment, is regarded as another prolific source of panics. The man who is pinched throws his stock on the market, and the more there is thrown the lower it goes; the speculator sells short and the public loses faith in that stock, when there is absolutely nothing wrong with it, only with the holder who cannot carry it. Stocks are also used to build up fictitious values on temporary earning power, and when the interest is reduced there is more tumbling of values. It is apparent that the monetary system of the world needs revision, but just how has never been made clear. Possibly the violent strains put upon financiers during the World War, and the experiences undergone may result in a bettering of methods, so that panics will be a thing of the past. That money panics are properly named is evident from the way in which the various great financial centres of the civilized world have withstood the shock of the World War. At first it appeared so unparalleled a calamity that it was doubted if the soundest financial institutions could survive the certain heavy drains for cash. The pressure was felt first in Austria, where the Vienna Exchange closed 27 July 1914. The Berlin and Paris exchanges followed, while the London and New York stock exchanges closed on the morning of the 31st. During the four days, stocks in New York had declined about 10 points on the average, and a deluge of selling orders was imminent. So the governors decided that closing the exchange was the only course open. In the meantime the rate of discount was advanced from day to day, and on 1 August the Bank of England fixed it at 10 per cent.

The moratorium was invoked to save the situation. The British government declared it in existence on 4 August for 30 days, applicable to long term bills of exchange; this was later extended so that it lasted three months. France, Russia, Austria-Hungary, Italy and practically all European countries followed this precedent, and established a moratorium lasting several months, while Germany covered the situation by ruling that foreign balances could not be sued for under three months. In the United States there was a general extension of time on all classes of indebtedness. The English banking system had to bear the principal weight of the first blow, being the "world's banker," and creditor of banks and large mercantile houses all over the globe. At first gold passed into London, but later the tendency was toward the United States, owing to the heavy expenditures here for war materials. Rediscounting was resorted to, and saved the situation, these rediscounts being treated as cash deposits. The British government stood back of the rediscounts of the Bank of England, and this gave universal confidence and prevented runs on the banks. The German financial situation was handled in much the same way, the discounts being extended as the situation demanded. Conditions in the United States at the outbreak of the war in July and August 1914 were better for resisting a panic than ever before. The system of Federal Reserve Banks (q.v.) established in 1913, was just ready to go into operation, and was admirably adapted to rediscounting, in fact it was designed to meet just such emergencies, though no one had anticipated such immediate need. The banks had the power to increase their circulations under the act of 1908, and thus conserve their gold, and this was immediately taken advantage of. The national banks of New York City increased their currency notes about $100,000,000 the first month of the war. On 16 Nov. 1914, the 12 regional banks were opened for business, and rediscounting was carried on easily. These exceptional experiences seem to point the way for preventing in the future most of the evils of great financial panics. It is likely that periods of commercial depression will come again, but the banks of all countries now know how to meet such emergencies, and protect each other, while governments are inclined to stand back of the banks.

PANINI, pä'ni-nĭ, Indian philologist: b. Salatura (near modern Attock), Punjab, 4th century B.C.; probably the oldest writer on grammar whose works are extant, although he quotes the names of 64 predecessors. He is reckoned among the sages of the Puranas. Nothing is known of his life. His grammar is in eight books, divided into chapters, and containing 3,996 rules or sutras. Its method is wholly different from that of European grammarians. The separate chapters treat the various phenomena of language as they appear in all the various forms of speech; hence the work is strictly a philosophical treatise, requiring to be studied as a whole, and not conveying sectional information in a form classified for reference according to the European model. His style is condensed, obscure and difficult to the Western student. He is the first who has classified the philological principles of grammar, as distinguished from the mere forms or parts of speech. He did not treat of syntax, and inflections are not formally given, but must be obtained by a collation of separate rules. The grammar of Panini has been often annotated. Its chief critic is Patanjali (q.v.). The chief edition of Panini is by Bothlingk (1887), and that of Patanjali's 'Great Commentary' by Kielhorn (1878-85).

PANIPAT, păn-i-pŭt', or **PANIPUT,** India, town in the district of Karnal, Punjab, about 52 miles north of Delhi, on the Grand Trunk and the East India railroads. It is a strategic centre and was the scene of the negotiations of Duryodhana and Yudishthira at the beginning of the 12th century B.C., of the Mogul victory of Baber over Ibrahim Lodi, which established the Mogul power in North India in 1526, of Akbar's victory over the Afghans in 1556, which reassured the existence of the Mogul Empire, and of the Afghan victory of 1761 over the Mahrattas, which prepared the way for English rule. It exports a coarse sugar.

PANITAN, pă-nē-tān, Philippines, a pueblo of the province of Cápiz, island of Panay; on the Malinannang River, seven miles south of Cápiz, the provincial capital. Pop. 10,020.

PANJAB, pŭn-jäb', **PUNJAB,** or **PUNJAUB.** See PUNJAB.

PANJANDRUM, the name applied to an imaginary personage of power and influence; a burlesque monarch or Great Mogul. The word was originally coined by Samuel Foote in a long string of rigmarole as a test for Macklin, who boasted of his memory. It is also called the Grand Panjandrum.

PANJIM, capital of Goa, Portuguese India.

PANJNAD. See PUNJNUD.

PANKHURST, Mrs. Emmeline, English «suffragette» leader: b. Manchester, 1854. She was educated in Paris and married in 1879 to Dr. Richard M. Pankhurst, who had been a member of the first woman suffrage society, founded by John Stuart Mill. She later served on the committee for promoting the Married Women's Property Bill, which was originally drafted by Dr. Pankhurst and subsequently became law. In 1886 Mrs. Pankhurst joined the Fabian Society in London and the Holborn Women's Liberal Association; she seceded in 1892 and became a member of the Independent Labor Party, running as its candidate for the Manchester School Board, though unsuccessfully. In 1893 she was elected a poor law guardian of Manchester, serving five years. On the death of her husband in 1889 she was appointed registrar of births and deaths. Together with her daughter Christabel she founded, in 1903, the Women's Social and Political Union (W.S.P.U.) and two years later inaugurated her well-known campaign of violent suffragism. On 13 Feb. 1908, she headed a deputation of 13 women to the House of Commons, thus starting a three days' riot, for which she received six weeks' imprisonment. In October she faced a similar charge and with her daughter was sentenced to three months, but was released before expiry of the term. In 1909 she conducted a lecturing tour in the United States and Canada. She led another deputation in 1910 to the Prime Minister, Mr. Asquith, who refused to see her. Four days later she marched on the same errand at the head of some hundreds of women. She was again arrested, but discharged. In March 1912 many of her followers, armed with hammers, indulged in an extensive window-breaking campaign among the West-end stores. With two others she drove to Downing street and threw a stone through a window, which resulted in two months's imprisonment. On 5 March the W.S.P.U. headquarters were raided by police, when Miss Pankhurst escaped to France. Within five days 124 women were arrested and Mrs. Pankhurst was sentenced to nine months' imprisonment for conspiracy. She adopted the «hunger strike» and was released on 24 June. Meanwhile, her example animated her followers to continue the campaign of outrages. A bomb was placed in the Home Secretary's office; attempts were made to fire the residences of ministers and the Theatre Royal in Dublin, where a hatchet thrown at Mr. Asquith struck the late Mr. Redmond instead. Acid was poured into letter-boxes throughout the country and much mail matter was destroyed. During January 1913, 50 women were arrested for window smashing; windows were broken in Lambeth Palace and in the Jewel Room at the Tower of London; hundred of orchids were destroyed at Kew Gardens, where a tea pavilion was also burned down; golf links were damaged; a house in course of construction for Mr.

Lloyd George was burnt at Walton Heath; railway stations were set on fire; several mansions, racecourse stands and a church were destroyed; the historic Smeaton Tower at Plymouth was attacked and a bomb placed in Saint Paul's Cathedral. Mrs. Pankhurst openly accepted the responsibility and declared herself the instigator of these acts. On 3 April 1913 she was sentenced to three years' imprisonment. Owing to "hunger-striking" she was several times released and rearrested, and finally discharged on 24 July. Her militant policy alienated much sympathy from the cause of woman suffrage. During the European war she devoted her energies to work of a useful, national character, in the course of which she visited Russia and America, while her second daughter, Sylvia, was arrested and sentenced in Australia for political agitation.

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Editorial Staff of The Americana.

PANMIXIA, in the theory of organic evolution, the cessation of the operation of natural selection. The process of the survival of the fittest, says Parker, has a reverse side, which has been termed the elimination of the unfit. Of the varieties that appear, some are less compeletely adapted to their surroundings than the majority, and these (the conditions remaining the same) tend to become destroyed owing to their unfitness to cope with their environment. The result of this process of elimination (apart altogether from the selection of progressive variations by which evolution, according to the theory, proceeds) is to keep up a certain standard of efficiency in the organs of the members of the species. Under certain conditions this *sustaining* influence, as we may term it, of natural selection may be suspended; the organism may be placed under conditions in which natural selection acts with reduced effect or does not act at all. There is, under such circumstances, no "elimination of the unfit"; and, as a result, fit and unfit survive indiscriminately, inter-breed and produce offspring, the ultimate outcome in the course of generations being a gradual deterioration in the whole race.

This suspension of the influence of natural selection or *panmixia* acts more commonly on single organs than on the entire organism. Thus if, owing to some change in surrounding conditions, an organ is no longer kept up to the previous degree of efficiency by the elimination of the individuals in which the organ in question is imperfectly developed, and, as these cross with one another, offspring is produced in which the organ is below the efficient standard; and by a continuance of this process through a series of generations, it is supposed that the organ gradually dwindles in size, and may altogether disappear. The cetaceans furnish good examples of the process. Consult Parker and Haswell, 'Text-book of Zoology' (1897).

PANNINI, pan-nē'nē, **Giovanni Paolo**, Italian painter: b. Piacenza, 1695; d. 1768. He studied under Luti and Lucatelli in Rome. His work was limited to interior and exterior decoration in Rome and its neighborhood and is of a very high order. His 'Interior of Saint Peter's' and 'Old Ruins' now repose in the Louvre and the National Gallery, London, contains 'The Pyramid of Cestius' and the New York Metropolitan Museum contains 'Cardinal Polignac Visiting Saint Peter's.' Other examples of Pannini's work are housed in Naples, Florence, Madrid, Vienna and London. The Quirinal contains some frescoes by him.

PANNONIA, pạ-nō'ni-ạ, *in ancient geography*, a Roman province on the Danube, including what is now western Hungary, Slavonia and Bosnia, eastern Austria and Styria. Neither the origin of the name nor of the inhabitants, the Pannonians, is anything certain known, but the people may have been of Illyrian stock with an admixture of Celtic due to a Celtic invasion in the 4th century B.C. They were conquered by the Dacians about 50 B.C. Octavian defeated them in 35–34 B.C., but they rose a generation later and Pannonia was finally conquered in 9 A.D., but not occupied save on the frontier until 102–107 A.D., by Trajan. The principal cities planted by the Romans were Vindobona (Vienna), Carnuntum (near Deutsch-Altenburg), Savaria (Szvonbathely), Arrabona (Raab), Siscia (Sissek), Poetovio (Pettau), Aquincum (Altofen), and Sirmium (Mitrovitza). Trajan divided the province into a lower and an upper Pannonia. In the beginning of the 5th century Valentinian III of the Western Empire ceded Pannonia to Theodosius II of Byzantium, who surrendered it to the Huns. It was occupied by the Ostrogoths about 450 A.D., by Theodoric of Italy in 488, by the Lombards in 527 and by the Avars in 568. Then came the influx of the Slavs.

PANO (pä'nō) **INDIANS**, a South American tribe living along the banks of the Ucayali and Huallaga rivers in Peru. They were formerly very numerous but now number less than 2,000. During the 17th century the missionaries persuaded many of them to gather in the mission villages. They were of a rather low grade, but understood hieroglyphic writing on bark. When the missions were broken up, in 1767, most of the Panos returned to their savage life, forming numerous small tribes. They have always been friendly to the whites. They are expert boatmen and build canoes some of which are 40 feet in length.

PANOAN INDIANS, a South American family comprising upward of 20 tribes and occupying the forest regions of Peru, Bolivia and Brazil. Among the better-known tribes are Cashibo, Conibo, Mayoruna, Pano, Remo and Setebo. They are a savage race in all that the name implies and several of the tribes practise cannibalism. They have steadily decreased in number during recent years.

PANORAMA, a picture representing a wide or general view, as of a large tract of country, so exhibited a part at a time by being unrolled and made to pass continuously before the spectator. It was invented in England in 1787 by Robert Barker. See also CYCLORAMA.

PANPIPE, an ancient wind instrument, the precursor of the organ (q.v.). It was formed of seven, eight or nine short hollow reeds, fixed together by wax and cut in graduated lengths so as to produce a musical scale. The lower ends of the reeds were closed and the upper open and on a level so that the mouth could easily pass from one pipe to another.

PANPSYCHISM (Greek *pan*, all, and *psyche*, soul), the theory that all things are essentially of a mental nature. In other words, it is the theory that all the phenomena to which we are accustomed to attribute a purely physical character are really associated with or constituted by minds of their states or perceiving, feeling, willing and reasoning. It is foreshadowed in the animism (q.v.) which precedes natural science, in which every natural occurrence such as the falling of rain, the motion of the sun and stars, or the growth of plants, is interpreted in anthropomorphic terms. In this stage of civilization, however, instead of an actual assertion of the existence of a psychical aspect in every physical occurrence, there is merely a lack of distinction between mind and matter. True panpsychism crystallizes out in Greek philosophy, as the original hylozoism becomes conscious of itself. The interpretation of the world in terms of form and identification of this form with idea is the essence of Platonism. This idea, it is true, is not in any individual consciousness; in Neoplatonism, however, the ideas of particular things come to be emanations from the one mind that is conscious of them — that is, the quasi-divine idea of the good. Stoicism (q.v.) also draws the necessary conclusion of panpsychism from its two theories of pantheism and of the psychical nature of God. This type of panpsychism is characteristic of many forms of European and Oriental mysticism. However, the name panpsychism is often confined to a different type of theory, which is due to Leibnitz. Here the mental nature of matter does not consist merely in a substantial unity between thought and its objects but in the existence of concrete acts of perception or feeling or of mental states of a lower (though yet definite) level, inseparable from every physical phenomenon. In the philosophy of Leibnitz the material world consists in an aggregate of dimly perceiving and dimly perceived monads or souls. Fechner combines a strict parallelism of mind and body with a pantheism and a belief in the omnipresence of mind. Clifford develops an atomism in which both mind and matter are built up of units of mind stuff. Clifford's theory is known as the mind-stuff theory. It is very like certain forms of present day empirical realism, in which sense-data and their relations are supposed to build up mind indivisibly in physical atoms and psychichal monads, qualitatively determined by the latter, and finding its most advanced expression in the intelligence of the higher animals. In this theory all matter is composed of elements, essentially psychial, internally — mind, externally — matter. Consult Clifford, W. K., in Vol. III, *Mind* o. s.

PANSLAVISM, a general name for the efforts of the Slavonic races in Europe for a unity of civilization and literature. An anonymous work, the 'European Pentarchy' (1839) and the writings of A. Gurovski, made a considerable impression in favor of a union under Russia; while later events favored the Austrian headship; but none of these projects ever possessed a reasonable chance of realization. The mere fact that the Slavonic race comprises nations so bitterly hostile as Russia and Poland, not to speak of geographical and political difficulties, and of such diversities of religious creed as are contained with the range of Christianity and Mohammedanism, made any attempt to unite the scattered elements of such a race in a voluntary political union impracticable.

The most important effort put forth toward the realization of a political union of the Slavs was in 1848, when, stimulated by the rival efforts at union of the German nations and especially by the summons to Bohemia to send her full contingent to the German Parliament, the Slavonic clubs summoned a congress of all the Slavs in the Austrian Empire, with a view to confer on the constitution of the empire. The congress met at Prague on 2 June. The various nations represented were classified in three departments: the first, consisting of the Bohemians, Moravians, Silesians and Slovaks or Western Slavs; the Poles and Ruthenians forming the Eastern Slavonians; the Slovenians, Croats, Serbians and Dalmatians the southern division. Each of these divisions chose 16 members, who formed a committee, with Palacky at their head, who drew up a plan of confederation and alliance among the various nationalities of the empire. The proceedings of the congress, however, which had to be conducted in German as the only common means of communication, could not be brought to a formal conclusion and the congress was interrupted by a Slavonic insurrection, which proved futile. After 1866 renewed but unavailing efforts were made by the scattered Slavonians of Austria to form a union among themselves, in order to counterbalance the preponderance of the German and Magyar races.

A great Slavonic congress held at Moscow in 1867 was also practically fruitless. An important product of Panslavism, however, is the work of its numerous scholars and authors in literature and philology, formulating exact principles for a comparative science of the Slavic tongues. Foremost in fostering the intellectual growth of Slavonic aspirations was Archbishop Joseph George Strossmayer (q.v.), who founded the South Slavonic Academy in 1867, Agram University in 1874 and was largely instrumental in reorganizing the entire educational and religious system of the Austro-Slavonic regions. (See BOHEMIAN LANGUAGE; CZECH LITERATURE). Due to the initiative of Czechs and Poles, a second Congress of Slavic nations was held in Prague in 1908, when resolutions were passed in favor of Slavic unity. The Russo-Turkish War of 1877–78 originated in the undercurrents of Panslavism, as also the Balkan Wars of 1912 and 1913, while they contributed to the Great European War of 1914–18 the assassination of the crown prince of Austria which precipitated the conflict. For further developments of Panslavism see BOHEMIA; CZECHS AND CZECHO-SLOVAKS; RUSSIA; SLAVS; WAR, EUROPEAN. Consult Levine, L., 'Pan-Slavism and European Politics' (New York 1914); Vrba, R., 'Russland und die Panslavismus' (2 vols., Prague 1913).

PANSY, an annual or imperfectly perennial herb (*Viola tricolor*) of the family *Violaceæ*. It is a native of Europe where it has been in cultivation for at least 400 years, and whence it has been taken to all cool temperate climates of the civilized world. The plant, which is rarely more than six inches tall, bears long-petioled, heart-shaped leaves and large irregular flowers which slightly resemble the human face. Its name is a corruption of the

French, *pensée,* thought, and its old folk-name, "heart's ease," signifies remembrance, a double reason for its popularity. Few flowers show the effects of care in selection more than the pansy. Naturally the blossoms are borne upon rather short stalks and are less than a third the size of improved varieties, which often attain a diameter of three inches. In dry climates fresh seed must be imported annually, since home-grown seed, even of improved strains, is apt to produce flowers inferior to the imported, each year emphasizing the deterioration. The cultivated pansies are grouped in strains rather than as individual varieties, and as a rule exhibit mixtures of blue, white and yellow, although some kinds are all of one color. Pansies thrive best upon rather heavy loams well drained and well supplied with plant food and humus. In the United States and other countries where the air becomes very dry during the summer, the plants generally fail during the hot months, even when planted in shady places, the most favorable situations. Hence, in such climates the seed is usually sown in cold frames during August or September, kept cool and moist by a rather thick mulch of loose straw until the plants appear, and then these are protected from drying winds. Being tolerably hardy the plants can be left in the frames during winter, previously having been transplanted from the seed-bed so as to stand about two inches apart. In the spring they may be allowed to blossom where they stand or may be transplanted to garden beds as soon as the ground can be worked. After flowering in these beds for a month or six weeks they should be replaced by geraniums or other heat-loving plants.

PANTHEISM (Greek, *pan,* all, and *theos,* god), *in philosophy,* the doctrine of the identity of God and the material universe. The doctrine stands midway between atheism and dogmatic theism. There are only three ways in which the philosopher can deal with the idea of the existence of God, that is, of a being who is the cause or original sum of all being. He may deny his existence altogether, or may infer psychologically that there is a God, and proceed to the inference that he is the first cause of all things, but leave unexplained the nature of the relation between God as cause and other existences as effects. Finally, he may proceed to reason back from the effect to the cause, and show a necessary connection between them. The last process is the source and explanation of pantheism. The origin of the idea of a God with the theist and the pantheist is the same. It is by reasoning upon ourselves and the surrounding objects of which we are cognizant that we come to infer the existence of some Superior Being upon whom they all depend, from whom they proceed or in whom they subsist. Pantheism assumed the identity of cause and effect, and the consequent adequacy of each effect, rightly interpreted, to indicate its cause. Matter, not less than mind, is with it the necessary emanation of the deity. The unity of the universe is a unity which embraces all existing variety, as proceeding from it in a way necessarily explicable by the result. Hence each existing thing contains all the explanation of its own existence which it is capable of receiving. The earliest school of Greek philosophy, the Ionian, in as far as it admitted any theism, was essentially pantheistic; and to the same school of pantheism belong Epicurus and Lucretius in ancient, and Giordano Bruno in modern times. The atomic theory, or the origination of all things in conscious atoms, is the culminating theory of this school. The Sankhya of Kapila, one of the most celebrated Indian systems of philosophy, in which probably developed the Buddhist religion, was the chief representative of pantheistic tendencies in the East. Kapila enumerates 25 first principles of things: of which the first (*mulaprakriti*) is matter; the second (*buddhi*), intelligence; the third (*ahankara*), self-consciousness. Speusippus, the sister's son and successor in the Academy of Plato, might be called an ultra-pantheist. He taught, what may possibly be considered the true logical culmination of the doctrine, that the Divine or Best is first indeed in rank, but is chronologically the last product of development. He defined happiness as the habit of conformity to nature. The soul, according to him, was a higher union of the arithmetical and the geometrical, or extension harmoniously shaped by number. The Stoics, differing widely from the school of Epicurus, may also be numbered among the adherents of pantheism. Their doctrine was that whatever is real is material. The universe as a whole possesses consciousness, and this consciousness is deity. The world undergoes a constant evolution, the elements of water, earth and air being evolved out of fire, which again absorbs them, and the process continues in an eternal cycle. The human soul and the deity, which are one in nature, act and react on each other. Intelligence, whether in man or the deity, they considered as consisting chiefly in force. Perhaps there is nothing which seems more opposed to pantheism than the mysticism of the Alexandrian school, and particularly of Plotinus, which makes of God so pure an abstraction that even thought, without being separated from individuality, cannot attain to it. Yet from the bosom of this school a prolific source of pantheism has arisen. Dionysius, the pseudo-Aeropagite, a Christian philosopher of the Neoplatonic school, introduced it among his speculations, in which the particular is derived by a series of gradations, as genus and species, from the universal. John Scotus Erigena, the founder of the scholastic philosophy of the Middle Ages, gave this speculation a realistic turn, making God the essence of the world, and the universal, the genus, the species and the individual so many particular developments which actually succeed each other. Eckhart, a German philosopher of the beginning of the 14th century, also a disciple of Dionysius, and often regarded as the father of German philosophy, taught some views which were developed in a pantheistic direction by some of his followers. Eckhart held that the works of creation were eternally in God in idea or conception; this was developed into a pantheistic doctrine of the eternal existence of ideas or types of all things. Giordano Bruno, like Epicurus and Lucretius, taught that monads are the elements of all existing things. God is the imminent cause of the universe. Power, wisdom and love are his attributes; but he is the monad of monads, the minimum because all things are external to him; the maximum because all things are in him. He produces the worlds freely, but by an inner necessity of his nature. The worlds are nature realized; God is nature working. Stars are moved by the souls that reside in them. God is in all things, as being in things that exist, or beauty in objects that are beautiful.

No modern pantheist has acquired a greater renown than Spinoza, probably because none has developed his doctrines into a system so comprehensive or with a logic so rigorous. A disciple of Descartes, he founds upon that master's definition of cause a system in which he develops the relation of God to the universe in a series of propositions, graduated like a succession of consequential demonstrations in mathematics. According to Spinoza the essence of God is existence, and he has two fundamental attributes, extension and thought. All things which exist are modes of God's attributes. Their existence is necessary, and all changes which take place in them, whether affecting intelligent or non-intelligent beings, are necessary. God alone is free, and he is free because he acts by an inner necessity and is not controlled by any other being. It may be added that Spinoza combats the apparent inference from his doctrine, that the sum of things which exist is God. Things are diverse, complex and limited, while God is one, simple and infinite. They are not God, but only the necessary modes of his attributes. Among modern pantheists a place is also due to Leibnitz. According to him all souls are monads, or atoms containing active powers consisting in ideas. God is the primitive monad; all other monads are its fulgurations. Bodies, as plants and minerals, are aggregations of sleeping monads with unconscious ideas. The relations of the monads are purely mechanical, and their co-operation is determined by the theory of pre-established harmony. The French philosopher Diderot recognized God in natural law, truth, beauty and goodness; for Leibnitz's monads he put atoms and gave them sense in place of ideas, which became thought in organized beings. Finally, the modern doctrine of evolution, when it assumes a transcendental form and carries speculation as to the origin of things beyond the range of inferences founded on the observation of nature, is necessarily pantheistic. See ATHEISM; DEISM; THEISM; THEOSOPHY.

PANTHEON, anciently a name applied to a temple or shrine dedicated to the gods. The most historical pantheon is that erected in Rome by Hadrian 117–138 A.D. and dedicated by him as a temple to all the gods. For 13 centuries it served as a Christian church, having been dedicated by Boniface IV about the year 607. It is 188 feet in circumference and is covered by a dome 142 feet in span. The entire height is 141 feet. Raphael and Victor Emmanuel II are buried in the Pantheon. Another noted structure bearing this name is the Pantheon of Paris (church of Saint Genevieve), for a description of which see PARIS.

PANTHER, a large cat, in North America usually a cougar; in South America a jaguar; in India or Africa a leopard.

PANTHER-CAT, a name locally given to several spotted wildcats; most often, probably, to the ocelot (q.v.).

PANTIN, păn'tăń', France, town in the department of the Seine, just without the fortifications of Paris. It has a number of thriving industrial establishments, including sugar mills and refineries, railroad car shops, boiler works, chemical and perfume works, glass works, oilcloth mills, etc. Pop. 36,359.

PANTOGRAPH, an instrument by the aid of which maps, plans and designs may be copied mechanically, either on the scale on which they are drawn or on an enlarged or reduced scale. It is made in a variety of forms.

PANTOLAMBDA, a primitive ungulate fossil mammal, occurring in North America and Europe but confined to the Eocene period. It developed the full series of 44 teeth with the upper molars of the selenodont type. The feet were stocky and postlike, closely resembling those of the elephant. The Pantolambdidæ never reached the length of body of its cognate type among the Amblypoda, the Coryphodon, which in some cases was as great as 10 feet. Consult Osborn, H. F., 'Evolution of the Amblypoda' (in *Bulletin* of the American Museum of Natural History, Vol. X, p. 169, New York).

PANTOMIME, the name given by the Romans to an actor in a dramatic performance consisting of dance and gesture. This sort of representation appears to have been indigenous to Italy. The modern Christmas pantomime in Great Britain is a spectacular play of a burlesque character, founded on some popular fable, and interspersed with singing and dancing, followed by a harlequinade, the chief characters in which are the harlequin, pantaloon, columbine and clown.

PANTOPODA, or **PYCNOGONIDA**, a group of marine spider-line, but hard-shelled arthropods, which is classified near the horseshoe crabs (*Limulus*). The body (*cephalothorax*) is so small and the limbs are so large that the animal, which may span two or three inches in large species, seems all legs, and a popular name along the New England coast is "no-body crab." There are four pairs of equally large many-jointed walking legs, in advance of which are two pairs modified into chelate mouth-organs, and a third pair upon which, in the breeding season, the male carries the eggs cemented to these appendages. The abdomen is represented by only a small tail-like part posterior to the legs. A metamorphosis occurs in most species, and the larva looks something like a nauplius, but is not equivalent to it. These curious creatures live from the shore-line to deep water.

PANUCO, pä'noo-kō, (1) river of Mexico, rising in the plateau north of the City of Mexico and flowing generally northeast. It forms part of the boundary of Tamaulipas and Vera Cruz and receives the waters of several smaller streams before emptying into the Gulf of Mexico near the city of Tampico (q.v.). Its bar has been removed by elaborate engineering works and the river mouth is now a fair port. (2) A district about this river, so called by Cortéz and his followers. It was partially conquered by Cortéz in 1522, but in 1526 was granted to de Guzman, who was independent of Cortéz.

PANYASIS, Greek epic poet of the 5th century B.C., ranked one of the five great epic poets of Greece for his poems on Heracles and on the Ionic migration. He was born in Halicarnassus, and is thought to have been the uncle of Herodotus. His few fragments are edited by Kinkel (1877); the most important are on wine, its use and abuse.

PAOAY, pä-ō-ī', Philippines, pueblo or town, province of Ilocos Norte, Luzon, three miles inland from the western coast, on a small lake; 12 miles south of Laoag. It is on the main highway. Pop. 12,743.

PAOLA, pä'ō-lä, Kan., city, county-seat of Miami County, on the Missouri Pacific, the Missouri, Kansas and Texas and the Saint Louis and San Francisco railroads, about 40 miles south by west of Kansas City. It was settled in 1855 and in 1869 was chartered as a city. It is in a fertile agricultural country and in a natural gas belt. Coal deposits are in the vicinity; cultivating grain and stock-raising are prominent industries in this section. The trade is chiefly in wheat, corn, livestock and coal. It is the seat of the Ursuline Academy, and has public and parish schools and a free public library which contains about 6,000 volumes. The city owns the water-supply system. Pop. 3,207.

PAOLI, pä'ō-lē, **Pasquale de,** Corsican patriot: b. Morosaglia, Corsica, 26 April 1725; d. near London, England, 5 Feb. 1807. He was educated at the Jesuits' College at Naples, and in 1755 was appointed captain-general by his countrymen, then struggling for their independence against Genoa. By his energetic efforts the government and military resources of the island were reformed, and he maintained a protracted and generally successful struggle with the Genoese. The latter, however, first made an agreement with France to garrison the places held by them in Corsica, and finally, in 1768, sold the island to France. After a brief struggle Paoli was obliged to yield, and fled to England. Here he remained 20 years, till the Revolution of 1789, when he was recalled by the National Assembly and made lieutenant-general of Corsica. Dissatisfaction with the extreme measures of the revolutionists in France soon led him to throw himself into the arms of England; in 1793 a British army was landed in Corsica, and through his influence the crown was offered to George III, in 1794. Paoli, however, did not obtain the government of the island and withdrew to England and was pensioned by the British government. His remains were removed to Corsica in 1889. Consult biographies by Arraghi (1843) and Bartoli (new ed., 1891).

PAOLO AND FRANCESCA, a poetic drama in four acts, by Stephen Phillips, based on the famous passage in Dante's 'Divine Comedy' (Il Purgatorio, Canto V). Paolo has been sent to fetch home Francesca, the bride of his stern warrior brother, Giovanni, tyrant of Rimini. Absorbed in his military enterprises, Giovanni commends Paolo and Francesca to each other's society with perfect faith in their loyalty to him. They, on their part, with no thought nor wish other than their duty to brother and husband, are overpowered by the irresistible call of youth to youth.

"Unwillingly he comes a wooing: she
Unwillingly is wooed: yet shall they woo."

Giovanni, discovering their guilt, is driven both by passion and his social code to destroy them, though he destroys thereby all that he loves in the world. 'Paolo and Francesca' belongs to the best of Stephen Phillips' work and when first published (1899) it was hailed as ushering in a new era in the poetic drama of the English-speaking world. It contains many passages of great beauty and has a singular pictorial quality; but as drama it halts and loiters by the way instead of moving swiftly and surely to its tragic end. The prose interludes in the tavern and in the opening scene of Act III, are as foreign to the tale as they are to the versification, while Paolo's soliloquy and the meeting of Paolo and Giovanni at the chemist's shop are awkward and thoroughly old-fashioned expedients. The only touch of novelty in dramatic treatment is in making the thwarted maternal instincts of Giovanni's housekeeper do service, in place of the customary villain, in arousing his suspicions. As a play, 'Paolo and Francesca' has neither the passionate sweep and dramatic intensity of d'Annunsio's 'Francesca da Rimini' nor the breathless atmosphere of mystery and impending doom in which Maeterlinck has enveloped an almost identical theme in 'Pelleas and Melisande.' It is essentially lyric in character in spite of its tragedy. This quality is exquisitely expressed in Giovanni's closing lines, as he looks upon the dead lovers:

. . "She takes away my breath.
I did not know the dead could have such hair.
Hide them. They look like children fast asleep."

'Paolo and Francesca' was first performed in London in 1902 and in New York in 1906.

PAPACY, the doctrine of the Roman Catholic Church relative to the authority of the Pope, that is, the Papacy, was officially promulgated by the Council of the Vatican in 1870. The primacy, it teaches, over the entire Church was conferred by Christ on Peter; and this primacy was one, not of mere dignity, but of full and supreme jurisdiction. This supreme authority is exercised by the bishops of Rome "for none can doubt; and it is known to all ages, that the holy and blessed Peter, the prince and chief of the Apostles, the pillar of the faith, and foundation of the Roman Catholic Church, received the keys of the kingdom from our Lord Jesus Christ, the savior and redeemer of mankind, and lives, presides, and judges, to this day and always, in his successors, the bishops of the Holy See of Rome, which was founded by him, and consecrated by his blood." Hence, the council continues, the Roman See possesses a superiority of ordinary power over all other sees; and this power of jurisdiction is immediate, so that to it all bishops, pastors and the laity, both individually and collectively, are bound to submit, not only in matters which belong to faith and morals, but also in those that appertain to the discipline and government of the Church. In virtue of this supreme power, the Roman Pontiff claims the right of free communication with the bishops of the entire world and their flocks. To him as to the supreme tribunal, in all causes, the decision of which belongs to the Church, recourse may be had and from his judgment there is no appeal. The assertion that it is lawful to appeal from him to an ecumenical council is condemned as false. The infallibility of the Pope in doctrinal matters is thus defined:

> "We teach and define that it is a dogma divinely revealed, that the Roman Pontiff, when he speaks *ex cathedra*, that is: when, in discharge of the office of pastor and doctor of all Christians, by virtue of his supreme Apostolic authority, he defines a doctrine regarding faith or morals to be held by the Universal church, by the divine assistance promised to him in blessed Peter, is possessed of that infallibility with which the divine Redeemer willed that his Church should be endowed for defining doctrine regarding faith or morals; and that, therefore, such definitions of the Roman Pontiff are irreformable of themselves and not from the consent of the Church."

It is not now maintained that the full significance of the Petrine primacy was manifest from the first in the life of Christianity; but rather, that there was, from the beginning, to borrow Cardinal Newman's words, a certain element at work, or in existence, divinely sanctioned, which for certain reasons did not at once show itself on the surface of ecclesiastical affairs, but gradually with the expansion of the Church, and in response to the needs of the times, developed into full vitality. What was the date of Peter's first appearance in Rome is not clear. Critics of all shades agree that Peter was in Rome in 64, when the Christian community was already established and that he suffered martyrdom there during the reign of Nero. Roman Catholic writers lay stress on the testimony of Eusebius and Jerome who refer to tradition in proof that Peter had been in Rome before 64. The earliest picture that we have of the Christian Church presents the community rather than the bishop. The writings of Clement seem to point out the community as the seat of authority: the letter ascribed to Ignatius of Antioch addresses the Church of the Romans; and Pope Soter in 170 speaks as in the name of the community, rather than in his own. But the march of events rapidly brought about two results, the domination of the bishops over the various churches and an active pre-eminence of Rome over the others. After the fall of Jerusalem, Rome, the political mistress of the world, soon became the centre of Christianity; other bishops began to consult Rome on ecclesiastical matters. Polycarp, the disciple of Saint John, had recourse to Anicetus on the vexed question of the Paschal celebration, though, it is true, he declined to abandon the Asiatic for the Roman custom. In 194 Pope Victor took steps to enforce the Roman discipline by the excommunication of recalcitrants. From the middle of the 2d century, the Gnostic and Montanist controversies served to bring the Roman authority into prominence. To the Church of Peter as to the witness of traditional doctrine disputes were referred. The imperial government, too, recognized the precedence of the Roman bishops over all others; the Emperor Aurelian, in 274, decided that the Christian Church property in Antioch should be dealt with as the bishops of Rome and Italy thought fit. In 256 Cyprian of Carthage speaks of Rome as the seat of the primacy. During the 4th and 5th centuries the Roman primacy looms larger and larger. The facts which indicate this rising domination are admitted by Protestant historians as well as by Roman Catholics. Newman cites as sufficient evidence for the 4th century the following passage from the Anglican Bishop Barrow:

> "The Pope's power was much amplified by the importunity of persons condemned or extruded from their places, whether upon just accounts or wrongfully, and by faction; for they, finding no other more hopeful place of refuge and redress, did often apply to him; for what will not men do, whither will not they go in straits? Thus did Marcion go to Rome and sue for admission to communion there. So Fortunatus and Felicissimus in Saint Cyprian, being condemned in Africa, did fly to Rome for shelter; of which absurdity Saint Cyprian doth much complain. So likewise Martianus and Basilides in Saint Cyprian, being ousted of their sees for having lapsed from the Christian profession did fly to Stephen for succor, to be restored. So Maximus the Cynic went to Rome to get a confirmation of his election at Constantinople. So Marcellus, being rejected for heterodoxy, went thither to get attestation of his orthodoxy, of which Saint Basil complaineth."

Many other instances of Papal interference for the restoration of bishops or the appointment of new bishops and the designation of others to act as vicars of the Pontiff are also cited from Barrow. While the apologists of the Papacy and its antagonists agree upon the facts, they differ in their respective interpretations of them. What one side considers as evidence of the universal recognition accorded to the primacy, the other treats as evidence of an ever-widening policy of «papal aggression.» The Protestant theologians, besides, throw emphasis upon a few notable cases of remonstrance addressed by bishops of other sees to the actions of Roman pontiffs, and see in Cyprian's acknowledgment of the primacy nothing more than an acknowledgment of pre-eminent dignity. The definitive recognition of the spiritual primacy is found in the great Council of Chalcedon, presided over by the legates of Leo I (451). The 630 bishops there assembled accepted as authoritative the profession of faith imposed by the Pope; they are reported to have unanimously exclaimed: «What Leo believes we all believe; anathema to him who believes anything else. Peter has spoken by the mouth of Leo.» The removal of the empire to Constantinople was fraught with far-reaching results on the Roman world in temporal as well as in spiritual affairs. In the 9th century writers is found a story that, on his withdrawal from Rome, Constantine granted to Pope Silvester, Rome, Italy and the Western Islands. This famous donation of Constantine was treated as authentic by the canonists and jurists of the Middle Ages. «It is,» says the latest English Roman Catholic historian of the Papacy,

> "a prophecy after the event. Paganism, abandoned, and soon to be persecuted by its Pontifex Maximus, without the conviction that makes martyrs, and long a hollow formality was dying. Christians had the State in their hands. What was more, they showed the fiery zeal, the proselytizing spirit, the exuberance in quarrels among themselves, which are signs of a youth rich in hopes, bent upon shaping its own victorious future. Heathen Rome invited them to subdue it. Public policy required that the centre of administration should be at the heart of the Empire. The balance of power was displaced. Neither Pope Silvester, nor any Pope for centuries, dreamed of disowning the imperial rule; from the Goths in Italy they suffered grievous things as the first subjects of Constantinople. But Rome left to herself was Rome in the hands of the Papacy; fronting the West and the barbarians, Constantine had imitated Alexander, who in setting up his throne in Babylon in 330 B.C.— a curious coincidence — and assuming the tiara, left Europe free to follow its own fortunes. Such was the real donation, not understood at the time by Pope or Emperor, which never lost its force until the northern nations grew into a world as rich, as cultivated and as haughtily self-conscious as the Greek."

The capture of Rome by Alaric in 410, the subsequent invasions of Italy by Attila the Hun and Genseric the Vandal, reduced the imperial authority to the shadow of a great name, and the wane of Byzantine influence was accompanied by a corresponding growth of political power in the Papacy in whom the people found their only protection and succor against the barbarians. For a brief interval the genius of Justinian, with the military successes of Belisarius and Nares, brought the popes once more under the sway of Constantinople. With the rise of the Lombard power in Italy the doom of the Western Empire was sealed. By his vain effort to extirpate the use of images in worship the Emperor Leo the Isaurian (726) drove the Roman and Italian populations to transfer their civil allegiance to the Papacy, which, through the wisdom, administrative ability, virtue and apostolic zeal of Pope Gregory the Great (590–604) had become the national centre of Italy, The pontificate of Gregory is a luminous phase in Papal history. It witnessed the rise of the Benedictine Order whose monks established Christianity in England and initiated the work of civilizing Europe. The Anglican Bishop Creighton summarizes the immediate and subsequent results of this mission:

> “While dangers were rife at Rome, a band of Roman missionaries carried Christianity to the distant English, and in England was founded a Church which owes its existence to the zeal of the Roman bishop. Success beyond all that he could have hoped for attended Gregory's pious enterprise. The English Church spread and flourished, a dutiful daughter of her mother-church of Rome. England sent forth missionaries in her turn, and before the preaching of Willebrod and Winifred heathenism died away in Friesland, Franconia and Thuringia. Under the new name of Boniface, given him by Pope Gregory II, Winifred, as archbishop of Mainz, organized a German Church, subject to the successor of Saint Peter.”

The middle of the 8th century saw the alliance of the Papacy with the Franks. The last of the Merovingians had become a puppet in the hands of Pepin, the mayor of the palace. The nobles offered the crown to Pepin, who consulted Pope Zachary. The Pope replied: “Let him be King in name, who is in fact so,” and Pepin was anointed by the deputy of Zachary (751). This fact became a precedent, in the public law of Europe, for the Papal claim of indirect authority over temporal sovereigns.

The grateful Pepin bestowed on Pope Stephen III large territories which he had wrested from the Lombards; and in return he received from him the title of Patrician of Rome, an event that opened the way to the establishment of the empire which with the Papacy was to constitute the unity of Christendom. Pepin's son, Charlemagne, was crowned emperor by Pope Leo III, in Saint Peter's, at Rome, on Christmas Day, 800. When under the descendants of Charles, the short-lived unity of the empire was broken up into separate states the Papacy stood forth in the minds of men as the paramount authority in the political, as it was in the spiritual, world. “The Church,” writes Barry,

> “instead of breaking up as Charles' monarchy had broken up, into petty and opposed principalities, is centralized in the West. A supreme court of appeal is set up in the sight of mankind, its charter the Bible, its weapons spiritual, but entailing penalties in this world. For deposition, interdict, excommunication, greater or less, carry in their train forfeiture of dignity, good, life, and the Holy See can reckon on sentiments which become the foundation of order, in the State and in the Church.”

Pope Nicholas I exercised his supremacy in both realms (858–867). He obliged the Frankish King Lothair II to take back the wife whom he had attempted to divorce. He deposed the powerful archbishops of Cologne and Trèves who had sided with the king, and against the opposition of the Byzantine emperor he condemned Photus, who had intruded himself into the patriarchate of Constantinople. About this time appeared the famous False Decretals, which were embodied in the canon law of Europe. This collection of decrees was first presented at the Synod of Quercy in 857, when the Frankish bishops were contending for alleged rights and privileges against their metropolitans. It purported to be the work of Isidore of Seville. There had been a genuine collection edited by this author. But the present volume contained, besides some authentic decrees, the Donation of Constantine, several forged decrees and acts of spurious synods. The author is generally supposed to have been a Western Frank. His object was to set up an entire immunity for the clergy and to present the Pope as not only supreme ruler in ecclesiastical affairs, but also the supreme appellant judge in even secular causes. The bishops were exalted and protected against their immediate superiors, but, on the other hand, they were reduced to something like a condition of feudal vassalage to the Pope. In short, the rights of synods, metropolitans, clergy and laity were swept away. The general conception embodied in these decretals was woven into the laws of Christendom during the Middle Ages.

The middle of the 9th century was characterized by a rapidly spreading confusion and civil and moral disorder throughout Europe. The most signal exercise of Papal authority was the conferring of the empire on Charles the Bald by John VIII. The Saracens, the Normans and the Slavs were carrying their victorious arms into southern, western and central Europe. Italy was the scene of incessant strife. The popes were unable to resist the attacks and oppression of Italian nobles and Norman chiefs. As the power of the great vassals of the crown increased, the disintegration of the empire continued its course; and something akin to anarchy prevailed. The condition of the Papacy reflected the evils of the times. Disorders in elections, corruption in administration, license in morals, mark the Papal history of this period. In the House of Theophylact the Papacy almost assumed the character of an hereditary monarchy. The lowest depths of degradation were reached when Alberic of Tusculum made his son, a vicious boy of 12, Pope under the title of Benedict IX. After holding the position for some time, Benedict sold it to Gregory VI, in order to get married. There was another claimant known as Silvester III. Benedict endeavored to resume the sovereignty. Monks like Peter Damian and Hildebrand deplored and endeavored to mitigate the universal disorder. The empire had passed to the German House of Otho. Henry III endeavored to put an end to the degradation by deposing the three unworthy claimants and appointing a German to the throne of Peter (1046). Notwithstanding the powerful influence and resolute endeavor of the monk Hildebrand the reign of misrule continued till he himself became Pope, under the name of Gregory VII. He set about the reformation not only of Rome but of the entire Church, recalled the clergy to the vows of their profession, took severe measures against the universal vice of simony and asserted the Papal claims against the secular powers. A long struggle of much vicissitude against the imperial power ended by the humiliating capitulation of Henry IV at Canossa (1076). The influence of the universities, especially those of Paris and Bologna, contributed, by their teachings in law, philosophy and theology, to establish the majesty of the Papacy as the supreme authority in the opulence of power ascribed to it by the Decretals of Gratian. The Crusades gave exercise to the popes' claim of suzerainty over all the temporal rulers of Europe. The Papal dominions were enriched in 1115 by the Countess Matilda's bequest of her extensive possessions. A long quarrel with the emperors concerning the right of ecclesiastical investitures ended in a further triumph of the Church over secular feudalism; the Concordat of Worms, however, conceded to the emperors the right to send deputies to the election of German bishops and of investing them with the regalia before episcopal consecration. This was the first of the concordats between the Papacy and the states which indicate the growing restlessness of the civil powers. About the middle of the century a more serious conflict arose between the popes and the Hohenstaufen emperor, Frederick Barbarossa, who undertook to restore the imperial authority over the Italian states and establish his sway over both clergy and laity. The genius of Alexander III triumphed; and Frederick, like Henry IV, was obliged to submit (1177). Everywhere, however, the young nations of Europe, developing their national codes, and becoming conscious of their strength, were, at the end of the 12th and the beginning of the 13th century, showing signs of restiveness under the dominion of the Church. In England Henry II began his struggle with Thomas of Canterbury. The constitutions of Clarendon claimed almost as much for the civil power as was demanded afterward by Henry VIII. Fearful that Henry might join hands with Frederick, the Pope temporized. But when the death of Becket stirred up the people against the king, the Plantagenet was compelled to sue for peace no less humbly than the Hohenstaufen. In the reign of Innocent III the power of the Papacy reached its zenith. A man of lofty character, indomitable courage and great political insight, he dictated to the rulers of France, Germany and England. For a short time the arms of Venice brought Constantinople under his spiritual sway. By the help of the Crusaders he crushed, with great severity, in northern Italy and southern France the sects which disputed the authority of the Church. The new orders of Saint Francis and Saint Dominic, powerful in their primitive fervor and virtue, renewed the religious spirit in every country and awakened in the consciences of the people the old devotion to the Church and its sovereign ruler. Innocent, more conspicuously than any of his successors, acted as an independent Italian prince, expelled the imperial officers from the domains which Matilda had given to Rome; and under him the states of the Church became an autonomous kingdom. Thenceforward we see the Pope strengthened and burdened with a temporal sovereignty; and more than once, in subsequent history, the necessity of defending it becomes a serious embarrassment to him in the discharge of his office of Spiritual Father of Christendom. Though Innocent was successful in asserting his feudal authority, the resistance offered to him indicated that the mediæval awe of the Papacy was rapidly passing away. Some of his acts rankled in the hearts of the peoples and bore fruit in later times. To trace the effect of his intervention in the affairs of England, by absolving the nation from its allegiance to King John, and by annulling, as vile and base, Magna Charta, the foundation of English liberty, would carry us to the days when, in a darker hour, another Pope, by a similar act of absolution, and of deposition of the sovereign rendered definitive the breach between England and the Holy See.

Another and a final struggle between the Papacy and the German emperors opened with the reign of Frederick II. Frederick attempted to reduce the popes to a state of dependence on the imperial authority. Gregory IX and Innocent IV vigorously resisted and after a long and demoralizing struggle overcame him; and the popes did not rest easy till the last of the Hohenstaufens, a mere youth, was beheaded (1286). With Frederick perished the empire which, under Charlemagne, had arisen as the temporal element that in union with the spiritual Papacy had formed the theocracy of the Middle Ages. Though the feudal Papacy had conquered the empire it was not destined long to survive it.

The French influence introduced into Italy soon dominated the elections and popes were chosen with a view, not to the interests of the Church, but to those of the French king. In the reign of Boniface VIII (1294–1303) the Papacy and the secular power closed in a death struggle from which the state rose victorious in the person of Philip the Fair of France. Already, by the instrument known as the Pragmatic Sanction, Louis IX had claimed for the Gallican Church freedom of patrons from Papal interference, freedom of election to chapters and immunity from Papal taxation without the consent of the Crown and the Church. The chief sources of revenue exacted by the popes about this period were the fruits of the first year taken from vacant livings and from money left by previous incumbents; the annates taken from benefices conferred by the Pope; taxes for the confirmations of bishops and for pallium fees; taxes for dispensations; Peter's pence; tributes from secular princes and religious institutions placing themselves under the protection of the Pope; the feudal tax from the vassals of the Pope. The popes widely exercised the right of presenting to benefices; granting "expectances" to benefices; nominating to certain reserved prebends and bestowing others in *commendam*. When Philip imprisoned a Papal legate the great struggle was on. In reply, Boniface issued the Bull *Clericis Laicos*, declaring that the civil authority possessed no jurisdiction over ecclesiastics. He summoned the leaders of the French clergy to Rome. Philip and his lawyers answered that the Pope had no authority on temporals and that his collations to benefices were null and void. Another letter from Boniface told Philip, "Let no one persuade you that you are not subject to the chief of the Heavenly hierarchy." Philip burned the letter. Then came the Bull *Unam Sanctam*, declaring that every human creature is subject to the Roman Pontiff. The end came when, after being maltreated at Anagni by the minions of Philip, he died, in prison, abandoned by all, 11 Oct. 1303. With him the mediæval Papacy passed away. For centuries afterward canonists and theologians continued to recite the right of the Pontiff to take away and to give crowns; but the world took no notice of the claim. Henceforward the Pope is for history the spiritual ruler of the Catholic Church and the sovereign of a small and gradually diminishing Italian state which, in 1870, was, against the protest of the Pope, absorbed in the kingdom of Italy. Even the most hostile historians of the Papacy concede it as much merit as is given it in the temperate .words of Barry:

> While it leaned on the people its triumph was assured; when it submitted to the feudal system, it courted disaster. Then the royal authority took away its rod of dominion; the king became Pope; the Pontifex Maximus retired into the holy place before him. Crimes, abuses, usurpation, scandals, and a secret change about religion in the thoughts of men account for this latter-day revolution. But it is difficult to imagine how Europe could have survived from the fall of the empire to modern times, had there been no central, supreme, and acknowledged power like the Papacy, guardian, at once, of faith, learning, and civilization. That it always rose to the height of that great enterprise will not be maintained by the historian, but its benefits outnumbered by far its abuses; and the glory is not dim which hangs round its memory, when we call to mind that it consecrated the beginnings of a peaceful Christian Europe, and watched beside the springs of art, science, industry, order and freedom.

By the transfer of the Papal Court to Avignon the Papacy passed under French influence, which along with the relaxation and disorders that attended its residence there seriously impaired its prestige (1305–77). Its return to Rome was the signal for the great schism of the West, in which Pope and anti-Pope contended for the allegiance of a distracted Christendom till the Council of Constance restored order by the election of Martin V in 1417. With the passing of the temporal Papacy, the spiritual supremacy of the Pope in the Roman Catholic world became more emphasized. The extent of Papal authority and prerogative in the Church was explicitly defined by the Vatican Council. A decree of the Council of Constance, which assembled in 1414, in order to terminate the Western schism, had declared the Pope to be inferior to a general council. The French clergy, in 1682, subscribed to a set of formulæ, known as the Gallican Articles, which affirmed that the consiliar authority is above the Pope, and, consequently, that *ex-cathedra Papal* utterances are not irreversible until confirmed by a General Council. After a prolonged debate, during which it was manifested that the decrees of Constance were intended to apply only to the occasion which gave them birth, and that the Gallican doctrine had been repudiated by the Church, the Vatican Council settled the question by the definition given above.

The long endurance of the Papacy, during ages which have seen the disappearance of every other European institution that was in existence when the Papacy arose, and of so many others that were, but are no longer, while it stands, is a fact which has arrested the attention of every serious historian. It is appealed to by the Catholic apologist as evidence that the Church is not a mere human institution. To arrive at an impartial estimate of the Papacy, the historical student needs carefully to distinguish its spiritual element — essential and abiding — from its secular adjuncts, which wax large and wane with the vicissitudes of time. (See CATHOLIC CHURCH; CHURCH STATES; POPE; TEMPORAL POWER; related references and biographies of different popes). For a classical explanation and defense of Papal supremacy consult Cardinal Newman's 'Anglican Difficulties' (Vol. II, 1898); or in 'The Chair of Peter,' by John Nicholas Murphy (1883); consult also Barry, W. F., 'The Papal Monarchy from Saint Gregory the Great to Boniface VIII' (New York 1902); Creighton, M., 'History of the Papacy' (6 vols., London 1902–04); Greenwood, A. D., 'The Empire and the Papacy in the Middle Ages' (London 1902); Milman, H. H., 'History of Latin Christianity' (4 vols., New York 1903); Nielson, F. K., 'History of the Papacy in the Nineteenth Century' 2 (vols., New York 1906); Ranke, L. V., 'History of the Popes During the Last Four Centuries' (3 vols., London 1908–12).

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PAPAIN, a digestive ferment isolated from the juice of the half-ripe fruit of the tropical papaw tree (*Carica papaya*). The juice is used in the West Indies to make meat tender. Papain is a grayish powder, soluble in water and glycerine, insoluble in alcohol, ether and chloroform. It digests fibrin and albumen more readily than pepsin, and in alkaline, neutral and acid solutions. It is used in some forms of dyspepsia, as a solvent of false membranes in croup and diphtheria, gastritis, infantile diarrhœa and for the removal of warts. As a solvent it is used in solution (5.15 per cent) in equal parts of water and glycerine. It has been recommended as a galactagogue and an anthelmintic. It is sold in powdered and tablet form and also as a glycerole.

PAPAJO (pä'pä-hō) **INDIANS**, an American tribe of the Piman family originally occupying a large part of Arizona. Branches of the tribe extended into Mexico. They were early christianized by the Jesuits and Franciscans and are nearly all devout Roman Catholics. They were once recognized as citizens by Mexico, but after the annexation of the Arizona country by the United States, the Papajos lost not only their citizenship but their lands and water rights, and were persecuted by the white settlers. During the early part of the 19th century they were almost constantly at war with the Apaches. They now number about 4,000, live on reservations and are devoted to agriculture.

PAPAL GUARANTEES, Law of, a law passed in 1871 by the Italian legislature with a view to adjusting the disputes between the papal curia and the civil government. It had all the appearance of a liberal, even generous, attempt at conciliation and the establishment of mutual independence. Its principal provisions were as follows: (1) The Pope was secured the standing of a sovereign power with a court, special ambassadors at Rome, separate postal and telegraphic communication with other countries, and an annual salary of 3,225,000 francs from the national exchequer. (2) The Vatican and Lateran palaces, etc., were settled on Pope Pius IX and his successors. (3) The *placet* or *exequatur* of the king was not to be required as a ratification of acts of papal authority in ecclesiastical matters. Bishops were not obliged to take oath of allegiance to the king. (4) The clergy were granted the right of assembling. (5) While the ecclesiastical courts were to have the right of deciding cases brought before them without any appeal against their decisions to the civil courts, the aid of such courts in enforcing her decisions was to be denied to the Church. The opinion of the Liberals was that this measure gave a Pope too much independence, and when it was submitted to the Powers England refused her sanction. Finally the Pope decided not to consider the Law of Papal Guarantees but to remain at Rome in his own right, without asking anything of the civil government.

PAPAL STATES. See CHURCH STATES.

PAPAL VESTMENTS. See COSTUME, ECCLESIASTICAL.

PAPANTLA, pä-pänt'lä, Mexico, town in the state of Vera Cruz, 115 miles northwest of Vera Cruz, on a well-watered plateau. It is in the centre of the vanilla district and has a population of 10,000. About seven miles from the city is a famous teocalli with other ancient ruins, all overgrown with tropical vegetation.

PAPARRHIGOPULOS, pa"pä-rē-gŏp'oo-lŏs, **Constantine,** Greek historian: b. Constantinople, 1815; d. Athens, 26 April 1891. His father, uncle, brother and other relatives having been beheaded after the Revolution of 1821, he left Turkey and was educated at Odessa under the patronage of the Tsar. In 1851 he became professor of Greek history in Athens. He wrote various monographs in Greek history, and collected in 1858 and 1890, and, in Greek, a 'History of the Greek People' (1860–74), which he abridged and rewrote in French under the title 'Histoire de la civilisation hellenique' (1878). Both these works aim to show the unity and continuity of Greek history, and especially to rehabilitate the inconoclastic emperors and show the importance of their reigns.

PAPAVERACEÆ. See POPPY.

PAPAW, a popular name for several distinct fruits. The papaw of the tropics (*Carica papaya*) is a small palm-like tree of the family *Caricaceæ*. It has usually an unbranched stem, which bears a crest of alternate leaves in the axils of which are borne racemes of small flowers, followed by yellow fruits sometimes a foot long and containing a large quantity of black seeds. The immature fruits are cooked like squashes, and some persons eat the ripe ones raw. In climates free from frost the plants are grown as a home vegetable or fruit.

Other papaws are members of the genus *Asimina* of the family *Annonaceæ*. The best known of these is probably *A. triloba*, a small tree native to the southern United States, but represented as far west as Kansas and as far north as Michigan and New York. The flowers, which are two inches in diameter and appear with the leaves, are at first green but change to purplish-red with yellow centres. The fruits are dark brown, from two to six inches long, and highly aromatic. As a garden fruit this species seems worth attention; selection should reduce the size of the large stones and modify the flavor. A few improved varieties have been disseminated. Apart from its fruit the tree is of considerable value for ornamental purposes.

PAPE, păp, **Eric,** American painter: b. San Francisco, 17 Oct. 1870. He was educated in Paris under Boulanger, Lefebvre, Constant, Doucet, Blanc and Delance, and at the École des Beaux-Arts under Gérôme and Laurens. He has lived in England, France, Germany, Mexico and Egypt. In 1897 he was instructor in the Cowles Art School of Boston and in 1898 founded the Eric Pape School of Art of which he remained conductor until 1913. Mr. Pape has exhibited 22 pictures at the Paris Salon, the Chicago Exposition and the Munich Kunst Austellung 1897; 120 paintings at the Omaha Exposition 1899, Paris 1900, 100 paintings at Buffalo 1901, and Saint Louis 1904. He designed a large monument to commemorate the founding of the Massachusetts Bay Colony and was master of the pageant at Gloucester in 1908. Mr. Pape planned and produced the Woman's Titanic Memorial performance in Boston, and directed the Italian Festa performance in Massachusetts in 1915. He has painted many portraits, also made a series of portrait-drawings for 'Ellen Terry's Memoirs' and has illustrated many important works. He has also attempted landscapes, in which field his best efforts are 'Early Morning. Annisquam'; 'A Breezy Morning'; and 'The Dying Day.'

PAPEITA, pä-pä-ē'tē, or **PAPEETE,** Society Islands, capital of the French islands of Polynesia, on the northeastern coast of the island of Tahiti. It has a good harbor, is the commercial centre of the neighboring islands and has a large export trade; it is also the most important French naval station in the Pacific. It contains a cathedral, a courthouse and other French government buildings. Pop. 3,617.

PAPELINE. See POPLIN.

PAPER (Fr. *papier;* Lat. *papyrus;* Gr. *παπυςορ*), a thin fabric or web composed of vegetable fibres felted together in sheets.

The word paper is derived from papyrus, probably the Egyptian name (with a Greek termination) of a sedge or bulrush of the Nile and marshes of Egypt. The plant was used by the Egyptians to make thin sheets primarily for writing upon, though some were used for wrapping. They stripped the rind from the long stems, exposing the pith which was then cut into thin strips. These were laid out flat side by side, forming a layer upon which other strips were laid at right angles to the first. The two layers were then compressed so as to adhere to each other. Sometimes, perhaps generally, three layers were superposed. The article thus formed was called papyrus.

Classification.— The commercial classification of paper is based primarily upon the different uses to which it is to be put. Logically the different kinds of paper fall into two groups: (1) paper for recording and (2) paper for mechanical or practical purposes. The first group may be subdivided into (*a*) «writing» paper, this being on the whole the best in quality is accordingly known as «fine» paper, and (*b*) «printing» papers, again subdivided into «book» and «news.» The second group includes many varieties, the most important being «wrapping,» but this, too, has many subdivisions. The classification of paper adopted by the United States Census Bureau follows pretty closely this logical idea and is as follows: (1) «news,» in «rolls» and «sheets,» (2) «book,» including «cover,» «plate,» «lithograph,» «map,» «wood cut,» «cardboard,» «bristol board,» etc., (3) «fine,» including «writing,» «ledger,» etc., (4) «wrapping,» including «manila» (made from rope or directly from jute, hemp and other strong fibres), (5) «straw» (at one time used for printing, but now relegated principally to the wrapping board classes), (6) «bogus manilas» (so called from their being imitations of genuine manilas, although composed of wood fibres), (7) «boards,» including «binder boards» (used for binding books), «pulp boards,» «straw boards,» «news boards» (made from old newspapers). «Boards» in general are used for making paper boxes and for many other purposes; finally (8) «miscellaneous,» including «tissues,» «blotting,» «building,» «roofing,» «carpet lining,» «hanging» (wall), etc.

According to the special census of manufactures taken for 1914 the paper mills of the United States in that year made upward of 250 distinct kinds of paper. Although the largest relative values were in fine papers, the larger tonnage by far was that of printing paper. The following figures of output quoted from that census afford a basis for accurate comparisons: Printing paper, 1,973,603 tons; writing paper, 195,351 tons; other fine papers, 52,377 tons; heavy wrapping paper, 98,780 tons; light wrapping papers, 399,593 tons; building and roofing papers, 243,908 tons; tissue papers, 115,401 tons; blotting paper, 14,157 tons; paper boards — pulp board, strawboard, binders' board, trunk and press boards; leather board, trunk and press boards; leather board, etc.— 1,208,795 tons.

Materials.— The foundation or basis of all paper is cellulose. All vegetable growths consist of (1) fibres mainly composed of cellulose and (2) various cellular and intercellular matters such as resins, etc. Paper is made of the fibres with as little as possible of the intercellular matter adhering to them.

Chemically, cellulose (q.v.) is a carbohydrate, with the approximate formula, $C_6H_{10}O_5$. But the fibres of which paper is ordinarily made are not pure cellulose; three types of cellulose compounds being recognized. These are: (1) nearly pure cellulose, typified by cotton; (2) pecto-cellulose, typified by flax; and (3) ligno-cellulose, typified by jute, and including practically all the pulp-wood fibres. All of the paper fibres in use carry to a greater or less extent a percentage of wax, fat, lignin, mineral salts and traces of other substances, cotton having the least.

Speaking generally, cellulose is resistant to the commoner solvents, and, therefore, may be readily freed from extraneous matters by chemical action. It is, however, subject to certain changes in the conditions prevailing in paper-making processes, resulting in the formation of oxy-cellulose and hydro-cellulose. The former is apt to be produced in the bleaching bath, as a consequence of the absorption of oxygen from the atmosphere, in cases where the bleaching is carried on under exposure to sunlight, or at a temperature unduly high. Its presence renders the paper in which it is contained brittle and weak, and faulty in taking dye and holding its purity of color. Hydro-cellulose is the result of a combination of the cellulose with water, resulting usually from the action of ferments in the presence of weak acids or alkalies. It is not wholly objectionable in all cases, being intentionally produced in the manufacture of grease-proof paper.

The typical linen fibre is hexagonal, or at least polygonal in cross-section, rarely round, with gently tapering ends. After treatment for paper making these ends are frayed out into a number of threads known as «laminæ.» A very narrow canal runs the length of the fibre. There are liable to be also minute nodules or bulbs strung along the fibre, but these are commonly crushed in the paper-making processes. Cotton fibre is flat or ribbon-like, with a canal much more pronounced than that of linen. Generally the cotton fibre twists in drying. Esparto fibre has a short smooth and round fibre, usually tapered at the ends, but often blunt. It, too, has a well-marked longitudinal canal. The fibre of straw is shorter and thicker than that of esparto, and not being so flexible exhibits kinks where it has been bent. It has also the peculiarity of the spiral cell, found in the bagasse of the sugar mill and in bamboo. In jute fibre the canal is very irregular, and there are numerous characteristic striations and markings. This fibre, though longer than that of straw and esparto, is much shorter than cotton or linen. Manila fibre is three times as long as jute, and is one of the strongest used in paper making. In this fibre the longitudinal canal is strongly marked. China grass or Ramie fibre is very nearly the same length as that of linen, but flat like cotton and twice as wide. Wood fibres as found in pulp are flat with a number of twists, as in cotton, but very much shorter. Those from coniferous woods are broader than cotton, and those from deciduous woods are narrower. The following table shows the length and breadth in fractions of an inch of the principal fibres used in paper making.

NAME OF FIBRE	Length in inches	Breadth in inches.
Cotton	1.1811	0.0098
Linen	0.9842	0.0078
China Grass or Ramie	0.8661	0.0197
Paper Mulberry	0.4724	0.0098
Adansonia	0.4724	0.0078
Manila	0.2756	0.0078
Bamboo	0.1575	0.0059
Sugar Cane Bagasse or Megasse	0.1181	0.0059
Wood, Coniferous	0.1811	0.0118
Jute	0.0984	0.0086
Esparto	0.0591	0.0047
Straw	0.0591	0.0059
Wood, Deciduous	0.0394	0.0078

News paper, in countries where suitable woods are plentiful, is generally made from wood pulp. Elsewhere rags, straw, esparto and other materials are used. The cheaper qualities are made of «mechanical» wood pulp; a better quality of «chemical» pulp, either alone or with a percentage of esparto, a combination possessing excellent characteristics. The highest grades of book paper are made from linen and cotton rags, but a very large and increasing percentage is made from wood pulp, principally chemical pulp, mechanical or ground wood pulp being used only in the cheaper grades, and with, generally, some admixture of cotton and linen fibre from rags. The two principal varieties of chemical pulp, namely, «sulphite» and «soda,» are both used extensively in book papers, a mixture of the two being desirable, as the sulphite pulp alone has a tendency to be harsh and semi-transparent. The best quality of «fine» papers are made of linen rags, chemical wood pulp and cotton rags being used for the lower grades. The best Bible paper is made of rag fibres with starch added to give opacity. The Oxford India paper is made under secret formulas, but successful imitations can be had. Featherweight papers are made entirely of esparto, very little sizing being used. Thick plate papers are made by rolling two or more webs of paper together while still wet. Art papers are coated with a mineral surface like China clay in size. Imitation art papers have about 25 per cent of China clay mixed in with the pulp, and this is brought to the surface by the calendering process. Writing papers of the highest grade are made of linen rag fibre exclusively. Lower grades have an admixture of cotton, and still lower a percentage of esparto or chemical wood fibre. Wrapping papers are made of all kinds of fibres, but in this country rags for this purpose have been practically superseded by cheaper fibres, notably wood pulp, jute, hemp refuse, old rope and twine, clippings and trimmings from higher grade paper stock and old paper. Boards are made of wood pulp, straw, old newspapers and other fibrous waste materials, according to the particular purposes for which they are intended. Tissue papers are made from a variety of fibres ranging from the manila hemp to wood pulp, the better class being of hemp and rag fibre well beaten and without size. Copying paper is very similar, but has a small addition of mineral matter to give it greater bulk. The papers produced in other countries comprise all those enumerated above and many other varieties or «specialties.»

From the 1914 census figures for the amount of materials consumed in the United States by the paper mills in that year an authoritative comparison may be made as to the relative production of the various kinds of paper. Pulp wood consumed totaled 4,470,763 cords; of which 1,892,739 cords were spruce, 602,754 cords were hemlock, 328,513 cords were poplar, and 817,057 cords of all other woods including principally balsam fir, southern pine, white pine, white fir, cottonwood, tamarack and gum. The total includes also 768,056 cords of spruce and 61,644 cords of poplar imported — chiefly from Canada. A rather large proportion (not specified) of this pulp wood was ground and made directly into paper by the mills which make both pulp and paper. Other mills which make only paper purchased a total of 1,521,980 tons of pulp — classified as ground pulp, 379,263 tons; soda fibre, 155,635 tons; sulphite fibre, 436,196 tons; sulphate fibre, 16,414 tons; mechanical screenings, 4,806 tons; and chemical screenings, 21,245 tons. Included in the total were 153,463 tons of ground pulp; 5,289 tons of soda pulp; 261,172 tons of sulphate pulp and 88,497 tons of sulphate pulp imported — mostly from Canada. Rags, which title included cotton and flax waste and sweepings, amounted to 361,667 tons, of which 88,664 tons were imported. Manila rope amounted to 64,256 tons. Jute bagging and waste totaled 56,914 tons, nearly all imported. Old and waste paper supplied 1,509,981 tons of paper stock, used largely in the making of paper boards. Straw consumed amounted to 307,839 tons; and all other paper stock, 97,276 tons, practically all imported grasses and foreign fibres.

Mention has been made of four descriptions of wood pulp — ground, sulphite, soda and sulphate. The distinctions between these classifications follow:

Ground Wood Pulp.— Grinding is confined to woods. Spruce is used chiefly, though other kinds of conifers are used to a limited but increasing extent. Trees upward of 10 or 12 inches in diameter are felled and transported to the pulp mill either (1) in logs or (2) sawed into lengths of usually four or two feet. Sometimes the wood is peeled in the forests but usually it has the bark removed at the mill by a «barker» or «rossing machine.» The «blocks» of wood two feet in length are brought into contact with a rapidly revolving vertical disc set with knives at an angle to the surface after the fashion of a plane, which shave off the bark as the block is rotated before them. Imperfections such as knots, gum seams and decayed portions, if left after barking, are removed by placing the blocks under a «splitter» which splits off the imperfect portions, but usually the block is suitable for «grinding» as it comes from the barker. It is then placed in the «grinder.» This consists of a sandstone or emery cylinder about four feet in diameter and up to 30 inches breadth of face set upon a shaft directly driven by a water wheel at great speed. The «stone» is enclosed in a steel case with openings or «pockets» at two or three points in the circumference. The wood, being placed in these pockets, is forced by hydraulic pressure «side-on» against the surface of the revolving stone. The object is to disintegrate the wood by a sort of tearing rather than cutting action and upon the condition of the stone, the relative speed and pressure, the quality of the pulp mainly depends. A continuous flow of water on the stone prevents charring of the wood through friction and carries away the fibrous particles as they are rapidly separated from the block. The pulp is known as «hot ground» if a minimum quantity of water is used, and «cold ground» if a large supply of water is run on the stone. Hot ground fibre is longer and drier, and is better adapted to the making of news print paper for use on quick-running presses. Cold ground pulp makes a stronger and more cohesive paper used in book printing on slow presses. The continuous use of from 75 to 100 horse power is required to produce a ton of pulp in 24 hours. Sometimes as much as 500 horse power is applied to one stone. The pulp-laden streams of water from the different grinders are then converged and directed upon a series of vibrating «screens» which strain therefrom the coarse particles. In some mills the pulp is «refined» by passing through a grinding mill of two horizontal stones, similar to a flouring mill. The flowing pulp stream passes downward through the centre of the upper stone, and the «refined» pulp is gathered at the perimeter. If the pulp is to be used at once for making paper in the same establishment, it either goes to the «reducers» which withdraw a large quantity of the water, thereby increasing the consistency of the liquid to a pulp mass, which is then stored in tanks; or, if it is to be transported or stored for future use, it passes from the screens in the same diluted condition to the «presses.» The press consists of a revolving drum covered with a very fine wire mesh which permits the water to be drawn through and discharged while the pulp fibres are deposited on its surface. The thin film of pulp being allowed to build up layer on layer is removed as fast as it reaches a suitable thickness for handling. The sheets of pulp thus formed, containing water and pulp in about equal proportions, are folded up into «laps» averaging 25 pounds in weight each, go into a hydraulic press to have the surplus water removed, and are then in convenient shape for handling and transporting. This form is known as «mechanical» pulp. In the market it is known as «wet» or «dry»; the former containing 50 per cent of water, the latter about 7 per cent — having been air-dried before baling.

Sulphite Pulp.— The two most important chemical processes for making pulp are the «sulphite» process and the «soda» process, both used principally in reducing coniferous wood to pulp, although the soda process in a somewhat modified form is used in treating straw, if intended for high grade papers, and in England for esparto. In the sulphite process the wood is prepared as for the ground wood process. The prepared blocks of pulp wood are then «fed» lengthwise to a «chipper» or set of knives which, revolving with great speed, transform the wood into small «chips.» The purpose of this is to facilitate the permeation of the wood by the «liquor» in which the chips next are immersed in the «digester.» The digester is a massive upright stationary steel vessels of an average capacity of from eight to 20 tons of wood, usually lined with cement or other material unaffected by acids. The liquor with which the digester is filled after the chipped wood is introduced is a solution of bisulphite of lime. The making of this liquor is an important feature of this process as upon its correct chemical composition the quality of the pulp largelv depends. It is made by passing the fumes of sulphur burning in especially designed «retort furnaces» either into a «tower» filled with limestone over which water is trickling or through «tanks» containing lime in solution with water. The result in both cases is the formation of a solution containing bisulphite of lime, and usually a small percentage of bisulphite of magnesia. Hence, the name «sulphite» pulp. After the digester is filled with chips and liquor it is closed hermetically, steam is forced in under pressure of 80 to 100 pounds and the chips are allowed to «cook» from 8 to 12 hours. Then the contents are discharged into «blow-pits» or vats beneath. These blow-pits have perforated bottoms through which the sulphite liquor drains away; and the pulp is washed by a stream of water which removes all traces of the liquor. The pulpy mass is then screened and pressed and put up in laps, similarly to the manner in which ground wood pulp is treated. In the process of «cooking» the intercellular portions of the wood are dissolved and the nearly pure cellulose fibre remains. Much care is necessary to stop the cooking at just the right point so as to leave the fibre properly freed from the surrounding substances, but unimpaired in strength. A process producing a sulphite pulp of superior strength and quality is made by a longer cooking (48 hours) at a much lower steam pressure (15 pounds). The bulk of the wood is reduced nearly one-half, whereas in the ground wood process both the cellulose and intercellular matter are preserved and the prepared wood (dry) and pulp are nearly the same, weight for weight, the only loss being in the mechanical process of removing the imperfectly ground wood. For high grades of paper «sulphite» is bleached. The sulphite liquor is put to a practical use in tanning; or is fermented and distilled, producing 15 gallons of 95 per cent alcohol for each ton of wood pulp made.

The Soda Process.— For this purpose poplar, basswood, beech and similar deciduous woods are used. The wood is prepared in chips as already described and cooked in lead-lined digesters, generally stationary, containing an 8 per cent solution of caustic soda. Steam at 100 pounds pressure is admitted and the cooking is continued for 8 to 10 hours. The pulp is discharged into iron tanks and «washed» thoroughly — to remove the freed organic matter and the alkali. The washing is so done as to use a minimum quantity of fresh hot water, as the «recovery» of the soda from the liquor used in washing is an important feature of this process. It is so successfully performed that in some mills as high as 90 per cent is recovered. The liquor is first «evaporated» under a partial vacuum by steam until it is of about the fluidity of melted pitch. In this state it passes into a revolving drum-like «furnace» where combustion is set up by means of a flame from an adjoining fire-box, burning wood or coal, which coming in contact with the pitchy liquor ignites it. The residue is a «black ash» which is then causticized with lime and becomes suitable for use again. After thorough draining the pulp goes to screens which remove coarse fragments and dirt, and thence to the machine which converts it into «half-stuff board.» Soda-pulp, partly on account of the nature of the wood itself and partly on account of the drastic treatment, is of a much softer quality than sulphite, has a shorter fibre and, therefore, less strength and the yield is less per cord of wood, rarely exceeding 50 per cent. It requires bleaching to fit it for use in all except dark-colored papers, as without bleaching it is of a brownish color. This process is conducted while the board is still wet, by subjecting it to the action of a bleaching powder bath at a temperature of 60° F. for from four to six hours. Or an electrolytic bleach may be employed. It is then thoroughly washed in drainers to remove every trace of chlorine.

Sulphate Pulp.— In this process only pine is used, and the liquor in which it is boiled is sodium sulphate. In some mills a proportion up to 30 per cent of caustic soda is added. The boiling continues for 30 hours during which the sulphate becomes sulphide. The formation of hydro-cellulose is encouraged, and the resulting pulp makes a very strong and tenacious paper.

Straw Pulp.— The straw of wheat and rye afford the most suitable fibre for straw paper, although oat straw is also much used on account of its long fibre, being generally mixed with wheat fibre. The yield from the raw material is about 40 per cent of cellulose. It is first put through a chopper which cuts it into small pieces in which condition it is carried by an air-blast to a sieve where the straw is caught and the dust and dirt carried along on the blast. Thence it goes to the boilers where it is charged with from 12 to 16 per cent of caustic soda. Under a pressure of 60 pounds of steam and at a temperature of 300° F., it is boiled for six hours, at which time it is in the «half-stuff» condition, and will flow readily through a pipe into the Hollander, where it is washed and disintegrated. Esparto and other grasses receive practically the same treatment, but do not require so high a boiler pressure nor so long boiling. All of these grass fibres are bleached — usually in the breaker.

Bamboo Pulp.— The successful development of a treatment of bamboo fibre which makes it available for an excellent quality of book paper adds enormously to the paper sources of the world, as it is estimated that bamboo constitutes about 80 per cent of the total of all wood growths. The stems are crushed and chipped to small fragments which are first boiled in hot water to remove an objectionable starchy filling. They are then boiled with a 20 per cent solution of a combination of three parts caustic soda and one part sulphide at 170° F. under 120 pounds pressure for one hour, and at 162° and 80 pounds pressure for four or five hours longer. The yield of dry pulp is about 45 per cent of the dry weight of seasoned wood.

Rags.— Cotton rags, consisting as they do of the nearly pure cellulose fibre and linen rags, being composed of fibres which have already undergone a treatment of maceration and «retting» to remove the intercellular matter, have only to be «cleaned» and separated into the individual fibres to prepare them for paper-making proper. The cleaning is both mechanical and chemical. The various preparatory steps are threshing, picking, sorting and cutting into small pieces. The last is commonly done by machinecutters, though for fine papers it is often done by hand. The cut pieces go to a duster, and for high grade paper are washed again. These pieces are next boiled from 12 to 18 hours under steam pressure of 45 pounds in a weak solution of quicklime or caustic soda, contained in revolving boilers, usually horizontal, called «rotaries.» This «kills» the colors and «starts» the grease and dirt so that when the cooked stock is placed in a «washer,» the impurities are readily separated, leaving the fibres quite clean. This washing is usually done in a «breaker» or «Hollander,» which consists of a rapidly revolving iron «roll» mounted in an oval-shaped tub and set with dull steel «blades.» The roll revolves over a «bed plate» and draws the «stock» through between the roll and plate, dragging the fibres apart while cleansing them. The Hollander is often made with two rolls operating in contrary directions. It is necessary, however, if the stock is to be used for high-class papers, to bleach them with some compound of chlorine. The «half stuff» is then let down into vats or «drainers» where the liquor is allowed to drain off.

Converting the Pulp into Paper.— Paper-making, in the restricted sense, begins with assembling the pulps and other materials, and mixing them thoroughly, at the same time further disintegrating the fibres. This is done in a «beater» or oval-shaped tub of an average capacity of about 1,000 pounds of paper in which revolves a horizontal roll with steel blades on the surface, running parallel with the shaft after the manner of a paddle wheel. These knives are of varying design — zigzag, elbow, knee and similar angular shapes. As the roll revolves the blades draw the «stock» between their edges and a «bed plate» of steel, thus «dragging out» or separating the fibres. In some beaters the bed also is set with knives so as to produce a shearing action with those of the revolving roll. The character of the resulting pulp is determined in large measure by the sharpness or dullness of the knives. In the making of grease-proof and Kraft papers the roll is usually of stone, and the bedplate may also be of the same material, the action being one of grinding instead of shearing. The time required in the beater for the various papers and fibres is as follows: linen and cotton for bond paper, 10 to 12 hours; rags for writing papers, five to seven hours; chemical wood pulp for book papers, four to six hours; cheap printing and newspapers, one and one-half to three hours; soft cotton fibre for blotting paper, one to one and one-half hours. It is, therefore, obvious that the character of the paper to be made is very largely determined in the beater, and this becomes the most important of the paper-making machines. This fact has led to the invention of several forms designed for special manufactures. For the highest class of rag papers the beater is of the old Hollander type, than which none is better. For cheaper papers higher speed in the reduction to pulp is desirable, and devices to accelerate the mixing and circulation of the components of the pulp have been added. In order that the machine may be used for different types of paper, the bedplate in some makes is in removable sections which may be replaced with others to produce a different quality of pulp, and the knife rolls also may be changed.

It will suffice from this point onward to describe the process of making news paper which is essentially the same as in all kinds of paper with certain modifications of which the most important will be noted. The beater is «furnished» with sulphite pulp and ground wood pulp in the proportion of about one to three. Other kinds of paper have their appropriate «furnish.» Sometimes a small percentage of kaolin, calcium sulphate (gypsum), barytes or other mineral «filler» is used, the quantity varying with the kind of paper to be made. In recent practice starch, formerly in use as «size,» has become an important filler. Its high cost, however, restricts it to high. The filler improves the color, surface, opacity and «feel,» and improves its printing properties. «Size» which is resin in a saponified form is added and has the effect in the final drying process of forming a kind of «varnish,» rendering the paper less absorbent. It also helps «fix» or hold the «filler,» increasing the strength.

Coloring matter, which in news paper is genally «aniline blue,» is put in, usually in solution, the object being the same as that of adding bluing to a batch of newly-washed clothes in the laundry — to give distinct whiteness. In the finest papers ultramarine and cochineal are the dyes used. When cream or pinkish shades are desired appropriate dyes are employed. In making colored cover papers and similar stock the matter of dyes is of much greater importance, and the whole series of permanent mineral and vegetable dyes are drawn upon. (See DYES). A scientific selection must be made as certain paper stock will absorb satisfactorily only dyes of acid reaction, while other «stuff» will require basic dyes. Often the best and most permanent results are obtained only by a combination of dyes of both reactions, the basic dye precipitating the acid dye. Basic dyes are as a rule of less permanency than acid dyes, but give higher brilliancy of coloring.

The coal-tar dyes most largely in use in paper making are the following:

	Basic Dyes	Acid Dyes
Yellows	Auramine Chrysoidin	Metanil yellow Quinoline Naphthol yellow Naphthol orange Paper yellow
Reds	Magenta Grenadine Rhodamine	Eosine Cotton scarlet Metanil red
Blues	Methylene Victoria New blue Paper blue	Soluble blue
Greens	Brilliant green Malachite green Diamond green	
Browns	Bismarck Vesuvine	
Violets	Crystal violet Methyl violet	Acid violet
Blacks	Jet black Coal black	Brilliant black

The prevailing practice in «furnishing» the beater is to add to the pulp first the loading, then the dye, then the size of resin, etc., and finally the alum, mixing in thoroughly each component before the next in course is added.

Alum is added as a mordant to «set» the color and also to «free» the resinic acid in the size and «set» or deposit it. The term is a technical one as ordinary alum is no longer used, but aluminum sulphate. After a thorough mixing in the beater the pulpy mass or «stock» is usually passed through a «refining engine,» the most common type of which is known as the «Jordan.» The purpose of the Jordan is to supplement the brushing out and mixing which has already occurred in the «beater» and to shorten the fibres if desired. It consists of a cone which revolves in a stationary conical case, the outer surface of the cone and inner surface of the case being set with numerous blades, the two sets of which can be made to approach as near each other as desired. The relative position of the blades determines the length of the stock which continuously passes between them. After leaving the «Jordan,» the stock is «screened» and then pumped upon the paper machine proper, having been thinned or diluted at various points of its passage so that when it comes upon the machine it behaves in all respects like an absolute fluid. The Fourdrinier machine on which all news paper is made may be divided into the «wet» part and the «drying» part. On the wet part of the paper is «formed» and given a consistency which properly entitles it thereafter to be called paper, the rest of the process consisting in still further increasing its consistency, drying it, giving it surface, etc. The liquefied stock, having come to the machine, flows from the «head box» through a wide aperture or mouth over an «apron» of waterproof cloth, and upon an endless horizontal wire cloth moving forward continuously. The relative rate of «flow» and «speed» of the machine determine the thickness or ultimate weight of the paper. The speed of the stock sideways is limited by two endless rubber bands about one inch square called «deckles,» one at each edge of the «wire.» In modern fast-running news paper machines the width of the web may reach to 200 inches. In the machines making the better class of book paper and writing papers the widths are generally somewhat less than 100 inches. The length of the endless wirecloth belt varies from 60 to 100 feet, the distance of travel, therefore, from the apron to the couch rolls being from 30 to 50 feet. The speed of travel of the wirecloth belt varies widely according to the quality of the output. High-speed news machines make up to 500 feet per minute. Machines which make good writing paper run about 60 feet to the minute. The cloth of which the wire belt is made has about 60 or 70 meshes to the running inch.

As the pulp flows on to the wire it contains 90 per cent, or more, of water. The water immediately begins to drain off through the wire and the fibres to deposit upon its surface. Through various devices so much of the water is removed that when the film of fibres reaches the point where the wire returns on its backward course, it is sufficiently compact or «felted» to be separated from the wire and conveyed by «felts» to and through the «presses» of which there are two or three. The presses are massive rolls in pairs, the paper supported by woolen endless «felts» passing between them. After this the paper readily carries itself and, passing over a short gap, it enters the «dryers.» They are cast-iron cylinders from 20 to 30 in number varying on different machines from three to four feet in diameter, arranged in two horizontal tiers, one above the other. The paper passes partially around each dryer, going alternately from one tier to another, conveyed by endless canvases called «dryer felts,» which serve to press the paper against the surface of the dryers heated by a constant passage of steam inside. Returning to the first formation of the sheet it is interesting to note the variety of means employed for disposing in the quickest possible time and within the most limited space of the vast amount of water in which the fibre is at first suspended. First, gravitation draws the water through the wire cloth. This is facilitated by a large number of small «table» rolls immediately under and supporting the upper part of the wire which, as they revolve, tend by capillary attraction to carry away the water and thus hasten its flow through the wire. The «shake» which gives to the wet end of the wire a lateral movement back and forth, intended to distribute the fibres evenly and prevent their arranging themselves longitudinally or in the direction of the flow, tends also to hasten the draining off of the water. A slight grade upward toward the couch roll also aids in an equal distribution of the pulp. This grade is adjustable so that the character of the deposit may be controlled. The wire, carrying the paper, passes over a series of «suction boxes» which have perforated tops and are subject to the action of exhaust pumps. The water is drawn through the wire and away through the suction boxes. Before the paper leaves the wire, it passes under a heavy «couch roll» which both presses out the water and by reason of being covered with a «jacket» of felt with exceedingly long nap, constantly absorbs water of which it is ingeniously rid by a «guard.» A recent improvement is a hollow suction couch roll. The «wet» presses act in the same way as the couch roll, pressing out and absorbing more water. But notwithstanding all these devices, the paper reaches the dryers with usually not to exceed 30 per cent of stock in the sheet, the rest being water which has to be dried out as the paper passes over the dryers at the rate often of 500 feet a minute. Water marks are produced by a «dandy,» a skeleton cylindrical roll covered with wire cloth, mounted over the «wire» between the first and second suction boxes, and resting on the web of paper. The design for the water mark is raised on the surface of the dandy and impresses itself on the paper. «Laid» paper is made with a dandy so covered with wires as to make an impression of parallel lines running lengthwise about an inch apart crossed at right angles by lines quite close together. The dandy also helps «form» or solidify the paper. In passing through the drying cylinders the paper web is carried on endless belts of dry felt, which serve to keep the web smooth and tight and prevent cockling. The number of drying cylinders of the Fourdrinier machine varies according to the type. On high-speed news paper machines there may be as many as 36 drying cylinders: on the slower fine-paper machines there are rarely more than 20. The diameter of these cylinders ranges from 48 to 60 inches, and they are arranged in series, usually with a pair of heated steel smoothing rolls of small diameter near the end. The drying rolls are heated by steam, the temperature gradually increasing toward the end of the series. As the web shrinks in drying, the rolls in a series are of successively smaller diameter, so that the relative length of the surface traversed shall be that of the drying web.

Machine or Tub-Sizing.— Fine papers, besides sometimes being «sized» in the beater, are usually sized on the paper machine, the web passing through a «tub» of some heated gelatinous mixture («animal size»). This tub is a long vat placed between the two series of drying rolls. The paper web is floated on the size and thence passes to a pair of rolls which squeeze out the excess, and so through the remaining drying cylinders. The paper is either dried (1) wholly on the machine or (2) partially, and then after being cut into sheets is hung in «lofts» to complete the drying. Although the web when it leaves the dryers is uniformly smooth, it lacks the quality of surface desirable in printing. It is, therefore, passed through the «calenders,» a series of chilled-iron rolls with polished surfaces arranged in a «stack,» the paper going in at the top and passing out at the bottom to the «reel.» This is practically an ironing process and by the regulation of the pressure of these calender rolls the requisite amount of «surface» is given to the paper. Book and fine papers are often «supercalendered» or passed through a second stack of calenders after the paper has been taken from the paper machine.

Coated Paper.— To meet the requirements of certain kinds of presswork, some papers are «coated» on one or both sides with china clay or other mineral substance, which gives an exceedingly smooth surface without the hardness of supercalendered papers.

Cylinder Machines.— The distinguishing feature is the use of a drum covered with wire (instead of the horizontal endless wire of the «Fourdrinier») which operates the same as the pulp press, already described. Several cylinders can be used on the same machine, each making a separate web, all of which are brought together before passing into the press, thus making paper of as many «plies» as there are cylinders. This principle is taken advantage of to make composite papers, one ply being of one quality, another of another, and also to make very heavy papers.

Cutting.— When the paper leaves the calenders and is reeled, it may be considered to be made. All that remains is to trim off the rough or «deckle edges» on the «slitter» where as it unwinds from the reel it passes between rapidly revolving knife-like discs. If it is desired to divide the width of the sheet it is done at this point by adding one or more sets of «slitter blades» according to the number of divisions of the sheet desired. Finally comes the «winder.» If the paper is intended to be marketed in rolls it is wound on either an iron «core» or, as is now more usually the case, on a core made from heavy tough paper, until the desired diameter is reached, when the rolls are taken away to the «finishing» section where they are «finished,» that is, wrapped in stout paper securely pasted and marked. They are then ready for shipment. «Sheet» paper was formerly cut into sheets by a «cutter» attached to the paper machine, but as the speed of the machines has increased this practice has been almost entirely abandoned and now it is usual to run the paper into rolls which are taken to the finishing section and cut into sheets on a cutter, the sheets then being «counted» and done up into «bundles.»

Sizes.— In the United States, if not elsewhere, the paper-maker has so conformed to the various demands of the consumer that standard sizes which were originally adhered to are, except in the case of writing papers, almost obscured by the great variety of special sizes. Four-fifths of the news paper is in rolls varying in length of roll (that is, width of web or sheet) usually from 30 inches to 75 and in diameter from two to three feet. The International Paper Company exhibited at the

Buffalo Exposition the largest roll ever made, being 152 inches in length and weighing 4,000 pounds, and the sheet unrolled would reach six miles. Some of the common standard sizes of news sheets are, in inches, 20 × 30, 24 × 38, 30 × 40, 32 × 44, etc. The sheets are put up in bundles generally of two reams of either 480 or 500 sheets to the ream and are either "folded" in quires or put up "flat" or "lapped" (one ream dovetailing into the other). Book paper is generally in sheets, although the use of web presses requiring rolls is extending to book and magazine publishing. The sheet sizes are many of them the same as news paper. The principal sizes of fine papers are antiquarian, 31 × 53; cap, 13 × 17; double cap, 17 × 28; columbier, 23 × 34; crown, 15 × 19; demy, 16 × 21; double demy, 16 × 42; elephant, 23 × 25; imperial, 23 × 31; post, commercial, 11 × 17; double post, 19 × 30½; folio, 17 × 22; double folio, 22 × 34; royal, 19 × 24; super-royal, 20 × 28. Wrapping paper and boards are furnished in both standard and special sizes. In recent years wrapping paper to a considerable extent has been prepared for the market in what are called "counter rolls," which are set upon the counter in a frame and torn to the size needed for the particular parcel to be wrapped.

Hand-made Paper.— The "hand" process came into existence at a very early period and still survives in some countries, notably in Japan. But the output of hand-made paper is very limited, except in Oriental countries, where, in contrast with the high development of the art elsewhere, the adherence for centuries to this antiquated process is a striking mark of their backward civilization. The method of making paper by hand has remained practically the same as it was more than 2,000 years ago. The pulp is diluted with water in a vat in which is immersed a "mold" or rectangular frame, on the top side of which are stretched parallel wires near together with others at right angles (woven wire cloth is now generally used). Upon this "mold" is tightly held a "deckle" or wooden frame. On withdrawing the "mold" from the vat in a horizontal position, the water within the deckle drains off, leaving the wires coated with fibres, the operator meanwhile shaking the mold so as to evenly distribute them. The film of fibres or paper is then stripped from the mold and laid upon a felt. Paper and felt are piled alternating, forming a "post," which is then pressed to extract the water.

HISTORY.

The existence of papyrus has been traced back to 2400 B.C., and no doubt it then had been in use a long time. In China and other parts of the world a similar article, made from rice stalks in practically the same way, is known to have been in use several hundred years B.C., and is supposed to have come down from a time even then remote. The Egyptian papyrus — the material, but not the art — was introduced probably about 325 B.C. into Europe as a consequence of the conquests of Alexander of Macedon and was used there very generally until the 8th century, when, together with parchment, it began to be replaced by paper made quite differently upon a principle which has survived to the present day.

Early Paper.— Papyrus is lost sight of in the 12th century. The new paper was of Asiatic origin. Its fundamental difference from papyrus was that the raw material in making paper was first reduced to pulp, that is, the natural structure was broken down so as to separate the component fibres, which were then rearranged to form a lamina or thin sheet. In China, Formosa, Korea and very likely elsewhere in eastern Asia this principle was used certainly before the Christian era. Though, as Pliny truly says, "the remembrance of past events depends upon paper (papyrus)," with the irony of fate, paper has failed to record its own origin, and much of the early history of the art is left to conjecture.

As early as 156 B.C. the Chinese made pulp from the small branches of the mulberry tree, various barks, bamboo, leaves, etc. In Korea the paper mulberry was chiefly used and the Japanese having begun to cultivate this tree made paper from it about 610 A.D. It is still to-day almost the only raw material used by them. The portion used is the inside bark. The probable course that paper-making took was from China and other Oriental countries to the eastern extremity of the Mediterranean (Persia and Arabia, about 620 A.D.), whence the Saracens carried the practice of the art to Spain after their conquests of that country in the 8th century. The consequent disruption of commercial relations with the Egyptians cut off the supply of papyrus and facilitated the substitution of true paper in Spain and other parts of Europe. Paper from Damascus had at about the same time found its way into eastern Europe, but the first paper mill in Europe was established by the Saracens in Spain. It appears that the Saracens used cotton for paper from a very early time and were probably the first to find that old cloth fabrics also answered the purpose very well. In Spain flax was the first material used and then cotton. The paper imported into Europe from Damascus was likewise made of cotton; 1085 is set as the date when "rags" were first used in Spain and 1100 for the first appearance of linen paper. The spread of the industry throughout Europe was slow, and its route and early development cannot be surely traced. Italy had its mills soon after Spain; France first learned to make paper in 1189; in Germany the first mill was built in 1390, while for the beginning of paper-making in England 1330 is given as an uncertain date. The western hemisphere was reached in 1690, when a mill was erected at Germantown, Pa., by William Rittenhouse. It is a curious sequel that to-day there is absolutely no paper made in Egypt, which supplied the civilized world for so many centuries with papyrus, and that the Chinese and other Orientals who contributed the fundamental principles of modern paper-making have made little or no progress themselves in developing the art. Although they have characteristically adopted Western machinery to a limited extent, they still in the main cling to archaic methods of making paper, which in that country is of slight commercial importance. The industry is now practically confined to Europe and North America. From the time rags began to be used in Europe, they rapidly displaced other materials on account of the economy of the double use of the fibre. Rags held sway in the paper industry for many centuries, but not entirely to the exclusion of numerous other materials. Esparto (q.v.), which is a Spanish grass, containing an especially good fibre, and other similar grasses, as well as straw, have long been used. In 1765 Schaeffer of Ranslon published a book printed on 60 varieties of paper made from as many different materials. Somewhat more than 100 years ago, under the stimulus of greater demand, the substitution of machinery for manual labor and the development of chemistry, attention was directed afresh to the use of fibre derived directly from the original growth as a substitute for rags. An impetus was given to the manufacture of paper from straw (first used about 1800), which has made it until recently an important factor in paper-making. In 1719 Reaumur first suggested the use of wood. Sporadic experiments to this end were made, but without noteworthy results until finally they culminated in the present mechanical and chemical processes of producing pulp from wood. Since it has been demonstrated that paper can be made from almost any kind of vegetable fibre, it only remains to discover new methods of treatment or improvement in old methods which will render more varieties of fibres commercially available. It is thus merely a question of cost of material and of conversion.

Processes of Manufacture.—Leaving out of consideration papyrus and rice paper, the reduction of the raw materials to pulp has always been a preliminary to making the paper. So far as we know this was done by the Chinese and kindred nations, the first pulp-makers, by beating the raw materials into a pulpy mass, with simple hand tools. They also at a very early date disintegrated the materials by either soaking them or boiling them in lyes. They thus originated two processes of making pulp which, though much modified, are still in vogue. As the Japanese and Chinese still depend principally upon hand implements for macerating the raw materials, we must look elsewhere for the earliest application of machinery for this purpose. Whether paper-makers used machinery before the introduction of rags is not clear, but it is highly probable that they did. Certainly machines driven by water power were in use soon after the adoption of rags. They were a sort of trip hammer which pounded the rags into pulp. In the first mill erected in Germany in 1390, such a machine driven by water power was used to prepare rags. Water power was also used in a paper mill in Tuscany some time in the same century. Whether at first rags were «cooked» before being beaten is not certain, but it was not long before it became customary to so treat them. The fabrics were first weakened with caustic and then macerated in a «beating engine.» The «Hollander engine,» the precursor of almost all modern types, was invented in 1750, and essentially as originally designed is still used. The greatest advance in the history of paper-making was made when toward the close of the 18th century a machine driven by power and making paper continuously was substituted for this single-sheet hand process. Modern paper-making may be considered to date from that time. Roberts, a Frenchman, working in a hand paper mill in France, is credited with this invention, and in 1799 his machine was installed by François Didot at Essone, France. In 1803 Fourdrinier and Donkin introduced essentially the same machine into England, where it was put into successful operation in the following year. That machine, in principle the same as those in universal use to-day, is known by the name of Fourdrinier, the maker, but not the inventor. It multiplied the productive capacity of labor enormously. Although a continuous web of paper was produced, it was invariably cut into sheets, for it was nearly 100 years before the invention of the web printing-press created a demand for paper in the form of rolls. Second only in importance to Roberts' invention was that of Dickenson, an English paper-maker, who, in 1809, invented the «cylinder» machine, a modification of the «Fourdrinier,» which has played an important part in the manufacture of wrappings, paper boards and generally the coarser grades, while the Fourdrinier is supreme in the book, news and writing-paper fields. The machines in use in the United States were:

In 1872, Fourdrinier 299, Cylinder 689.
In 1900, " 663, " 569.

Great improvements have been made not only in the paper machines proper, but in the other machinery used in pulp and paper-making, and the use of raw materials has been revolutionized so that paper-making as a whole made an enormous stride since the day of Roberts, but still his time must be regarded as an epoch in the history of the industry.

Growth of the Industry.— The earliest use of paper was for writing purposes. As the art of writing was for so many centuries confined to a small portion of the world's population, and as few copies of books were made, the consumption of paper must have been very limited compared with many other commodities. But the invention of printing which led to the manifold production of books gave a great stimulus to the industry. It is probable that the use of paper for numerous mechanical and practical purposes is of comparatively modern origin except that it has always been used more or less for wrapping. But paper was too much of a luxury to be used freely for wrapping until recent times, and even now, for example, in Italy as a usual thing frugal shop-keepers do not furnish wrapping paper, and not uncommonly the buyer, if he wishes his parcel wrapped, takes with him the paper, usually an old newspaper or sheets from a child's copy book; these he uses as long as they will hold together. There has been at all times a reciprocal relation between paper-making and many other arts and industries, progress on the one side stimulating progress on the other. Thus, for example, improvements in printing have not failed to meet a response from the paper-maker with cheaper product. The use of web presses for printing newspapers has stimulated improvements in the process of making paper which reduced its cost and the reduction in price in turn has been a very important factor in the growth of the printing and publishing industries.

The production of paper is now centred principally in the United States, England, France, Austria-Hungary, Belgium, Holland and Scandinavia. These countries lead both in the methods of manufacture and the quantity of output. In general there is a striking relation between the intelligence and progressiveness of a country and the quantity of paper consumed. It follows as a corollary that the United States has a greater per capita production than any other country. The total number of paper mills in the world is between 4,000 and 5,000, including numerous small establishments in China, Japan and other Oriental countries, where paper is made mostly by hand, but no reliable statistics exist to show the total production of the world. A rough estimate would make the world's production upward of 9,000,000 tons annually. This is approximately three times the world's annual growth of cotton; the significance of this comparison is that it indicates the insufficiency of rags as raw material and the importance of the inventions which have led to so general a use of wood pulp.

Modern Conditions.— If we take the United States as a type the most important factors in paper-making are raw materials (spruce and poplar wood, rags, straw and old papers), water power and fuel. About three-quarters of the total tonnage of paper made in the United States is composed of wood pulp. The percentage made from rags is very small, not more than 5 per cent or 6 per cent, but the value of the rags used in the last census year was $6,595,000 as compared with $9,837,000, the value of the wood used, demonstrating that rags are used chiefly in the highest grades of paper. Water power is not only indispensable for making ground wood pulp but is generally relied upon to drive the beating engines and other heavy machinery. Coal is required principally for producing heat to dry the paper, but also for additional power.

Other important conditions affecting the production of paper are the existence of good transportation facilities and the proximity of large markets. All these factors combine to put the United States at the head of the paper-making countries. An advantage which American ingenuity itself has created is the superiority of its paper machinery, especially in point of capacity; American machinery being, as a rule, larger and operated at greater speed than that of other countries. It is this fact that more than compensates for the much higher scale of wages prevailing here than in any other paper-producing country, even after due allowance has been made for the superior character of American workmanship. The machine tender, for example, who receives $3 and upward a day in the United States, in England receives $1.66, in Germany $0.75, while in Italy, Scandinavia and other countries even less. The exporting of American paper machinery has a decided tendency to neutralize the advantage that the United States paper-maker might have if it could be kept for his own exclusive use.

Combinations.— The most striking of recent changes in the industry in the United States is the consolidation of many mills under one ownership and management. Already a majority of the "news," "writing" and "boards" mills have thus come together, forming the largest companies in the world in their respective branches. There is a national organization of paper manufacturers of the United States known as the American Paper and Pulp Association, founded in 1878.

Production.— The special census of manufactures taken for 1914 showed that in that year the total number of establishments in the United States engaged in making paper of all kinds, paper boards and wood pulp was 718. Of these, 495 made paper exclusively; 160 made both wood pulp and paper; and 63 made pulp exclusively. These 718 concerns were capitalized at $534,625,600, and employed 88,457 hands to whom they paid in the year $53,245,639 in wages. The raw materials consumed by these factories cost them an aggregate of $213,181,286, and the value of the products turned out was $332,147,175. These products consisted of 1,313,284 tons of news paper in rolls and sheets, valued at $52,942,774; book paper, plain, 786,626 tons, valued at $58,496,221; other book paper, coated, plate, lithograph, map, wood-cut, cover paper, etc., 148,353 tons valued at $15,103,260; cardboard, Bristol board, card middles, ticket board, etc., 83,010 tons, valued at $5,376,434; writing paper, 195,351 tons, valued at $228,637,257; other fine papers, 52,377 tons, valued at $5,417,661; wrapping paper, manila, 77,878 tons, valued at $7,070,254; heavy wrapping, 98,780 tons, valued at $3,588,357; wood or bogus manila, 353,987 tons, valued at $17,975,636; Kraft papers, 109,752 tons, valued at $6,949,244; all other wrapping papers, 241,001 tons, valued at $13,789,262; paper boards — pulp board, strawboard, news board, binders' board, trunk board, pressboard, leather board, etc.— 1,208,795 tons, valued at $39,493,174; hanging paper, 96,527 tons, valued at $4,488,910; tissue paper, 115,401 tons, valued at $11,535,720; blotting paper, 14,157 tons, valued at $1,457,897; building, roofing, sheathing, and asbestos paper, 243,908 tons, valued at $9,475,733; all other papers — poster, tag stock, etc., 130,459 tons, valued at $9,890,641. This production, as measured by its aggregate value, shows an increase in the 10 years since 1904 of 76 per cent. The industry finds its greatest development in New York (17 per cent), Massachusetts (13.1 per cent) and Maine (12.1 per cent). Wisconsin shows an increasing interest (9.4 per cent), Pennsylvania (7.7 per cent), Ohio (7.0 per cent), Michigan (6.6 per cent) and New Hampshire (5.3 per cent) also contribute a substantial proportion of the country's total output.

Exports.— The paper export business of the United States was insignificant until 1878 when the "paper and manufactures thereof" exported amounted to about $1,000,000. For the year 1914 the amount was $11,023,774; and 12,036 tons of wood pulp, valued at $529,741. The exports consist largely of news paper which goes principally to England and Australia.

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Revised by RICHARD FERRIS.

PAPER-BIRCH. See BIRCH.

PAPER CURRENCY. See CURRENCY.

PAPER INDUSTRY IN AMERICA. In 1690 William Rittinghuysen, an experienced paper-maker from Broich, Holland, entered into partnership with William Bradford (q.v.), the first American printer, and together they opened the first paper mill ever established on American soil. It was located on a creek since known as Paper-Mill Run, conveniently near Philadelphia, and here a very fair quality of paper was manufactured out of pulp made from the rags of the home-grown flax. As the colonists had no other paper mill for fully 20 years, when William de Wees opened a rival establishment in close proximity to the first one, the enterprise was a profitable one, in spite of the fact that the making of paper by hand — the only method known in those days — was a laborious and costly process. This primitive system was in vogue in America until 1756, when the first pulp-engine was introduced in this country from Holland.

Within less than 15 years, there were 40 mills in various parts of Pennsylvania, Delaware and New Jersey that were turning out an aggregate annual product valued at more than $500,000. In 1794 another large mill was established at Troy, N. Y., by Websters, Ensign and Seymour, and, during the same year, a mill for the manufacture of coarse wrapping paper from the bark of the basswood-tree was opened at Fairhaven, Vt., by Matthew Lyon. This was the first establishment in the United States to attempt to make use of anything except rags for pulp.

In the ordinary paper mills the method of manufacture was still a crude process. To make paper the pulp was floated in vats, at the side of which stood the workmen, mold in hand. This mold was of wire cloth, around the outer edges of which a rim was formed by superimposing a thin frame called a «deckle,» which prevented the pulp from flowing off, and left the water no other escape than through the bottom of the mold. Into this the pulp was dipped and, as the water drained away, the pulp was left in the form of a thin layer covering the bottom of the mold. At this point it was given to another man — a workman known as the «coucher»— whose duty it was to remove the mold. This was done by the application of a piece of felt to which the pulp adhered in the form of a thin sheet; a second piece of felt was then placed on top of this; to this felt another pulp-mold was applied, and this process was continued until the pile of alternate layers of pulp and felt had attained the requisite height. From this pile, or «post,» as it was called, all the water was thoroughly expressed, and the pulp, separated from the felt, was pressed, and hung upon the «tribbles,» or lines in the drying-room. This portion of the process completed, the sheets were still rough and somewhat like blotting-paper, so it was necessary to dip them in size, and to press and dry them again, before they assumed the character of a finished product. Laborious as this method was, it was the only process known until after the beginning of the 19th century.

The first marked improvement in the art of paper-making came with the introduction of the Fourdrinier machine. This invention was originally conceived by Louis Robert, a workman in François Didot's paper-mill, at Essone, France. In 1799 he secured a patent for a process of making paper by an endless web-machine, but, as he was financially unable to carry such an idea into effect, he sold his rights to Leger Didot, who took the patent to London. In 1804 he persuaded two brothers, Henry and Sealy Fourdrinier, both wealthy London stationers, of the practicability of the scheme, and finally transferred his interests in the invention to them. As the result, the machine has since borne their name.

In the meantime the paper-making industry in the United States had enjoyed steady growth. By 1810 the number of mills had increased to 185, and their annual product was valued at more than $800,000. Already the demand for rags had become so great that the manufacturers, finding the domestic supply utterly insufficient, had commenced to import them. In 1817 the first power-mill in the country began operations at Pittsburgh, Pa., and, about the same time, Thomas Gilpin and Company, of Wilmington, Del., commenced to make paper by machinery. These machines, however, were of American invention.

Although the Fourdrinier machine was in use in England as early as 1806, it was not introduced in the United States until 1820. That it had revolutionized the making of paper there could be no doubt. By its use a seven-vat mill which had previously been operated at an annual expense of $13,000, could now be run for a sum not in excess of $3,600, and yet, while the American manufacturers knew all these facts, the cost of such machines was so great that they hesitated to introduce them. The machine utilized an endless web of wire cloth. As it revolved a stream of liquid pulp flowed over it evenly, the precipitation of the water through the cloth being so nicely adjusted that it was completed at the very moment in which the pulp-sheet met an endless belt of felt, which not only removed the pulp from the wire, but bore it on, through the heavy metal rolls which pressed it. separated it from the felt, and passed it over the steam-heated cylinders upon which it was dried, expelling it, at last, in a condition ready to be polished and cut into sheets.

As rag pulp is still used in the making of expensive grades of paper, the preliminary process to which rags are subjected is interesting. First cleansed and softened by being boiled in a strong lye of caustic alkali or lime, the rags are then placed in a washing machine, in which a heavy cylinder, with knives attached, partially macerates them. Everything except the vegetable fibre itself is then removed, a solution of bleaching powders is added and the mass is left in stone vats to bleach as long as may be necessary. This process completed, the substance left is taken to the beating engines, where, after it has been thoroughly washed with water to remove all trace of the chlorine, it is reduced to pulp and transferred to the Fourdrinier machine. Of course, during the past hundred years, so many changes have been made in this mechanism, so many modifications and improvements, that it is difficult to realize that it bears any relationship to the original invention.

In 1809 an English manufacturer named Dickenson perfected another invention for making paper. It was called a "cylinder-machine," and differed from the prior invention by being fitted with a hollow, perforated, wire-gauze-covered cylinder, which operated directly in the pulp-vat by drawing out the water and leaving the sheets of pulp on the gauze, by which it was conveyed to the felt belt, and, thus, through the couching-rolls. In other respects it followed the principles of the Fourdrinier machine.

The American invention, which was first used in 1817, was of similar construction, but no other machine was known in this country until 1820, when the Gilpins imported machinery for making paper. In 1822 John Ames, of Springfield, Mass., invented a new cylinder-machine, and, in 1829, this invention had been so improved that its general use was assured. It was in this year that straw and grass were first used in making paper by Shryock, of Philadelphia; in 1830 the manufacture of Fourdrinier machines was commenced in Connecticut by Phelps and Spofford, and, in 1831, the discovery of the value of chlorine in cleansing pulp-fibre permitted the use of hitherto unavailable substances for paper stock. By 1850 there were only five mills in this country that still clung to the hand-made process of paper-making, and paper-machines had been so greatly improved that laid paper was, at last, produced by that method.

The general use of straw paper began in 1857. Some three years previous to this time, a Frenchman, A. C. Mellier, had succeeded in converting several vegetable fibres, notably straw, into pulp which he believed would be suitable for use in the manufacture of paper. The process, which has since borne his name, was neither a difficult nor a costly one. The straw was first thoroughly soaked, and, after it had been cleansed, was boiled, at a temperature of not less than 310° F., in a solution of about 4 per cent of caustic soda. Although Mellier peddled his idea from one end of the country to the other, the big manufacturers of paper did not seem to consider the scheme a practicable one, and three years, therefore, elapsed before he was able to persuade anybody to invest their money in his project. The man who finally undertook to manufacture paper by this process was J. B. Palser, a member of the firm of Howland and Palser, but the factory which they established at Fort Edward, N. Y., for the express purpose of carrying Mellier's idea into effect proved an excellent investment. In 1859 Palser himself patented some important improvements upon the process, and from that day straw paper became one of the staple grades on the market. One of the direct effects of this innovation in the paper industry was the rise in price of rye straw. Of course, straw paper was by no means a perfect product, and was not entirely suited to many of the purposes for which it was used. Thus, for example, the silicious character of the straw was shown in the hard, brittle surface of the paper, a factor which alone represented a great disadvantage, from the printer's point of view, for such paper wore out type about twice as fast as the softer surfaced paper had done. Moreover, the glassy surface of the paper did not tend to durability, and yet, in spite of all these objectionable features, nearly all the newspapers were printed upon it, even until after the Civil War, but no great regret was felt when it was finally superseded by wood-pulp paper.

The quarter of a century that passed between 1830 and 1855 was largely an experimental period in the history of paper-making. During this time every substance that could possibly have possessed the requisite fibrous qualities was put to the test. Rags were out of the question, even straw was rapidly becoming too expensive, and other fibres had proved generally unsatisfactory. In 1854 Wells and Burgess, of London, obtained a patent for a chemical wood pulp, and, a year later, Hugh Burgess, of Pennsylvania, invented a process by which the wood of the poplar might be used. The use of ground wood pulp dates from 1844, when a German, named Keller, invented a wood-grinding machine of such practicability that Voelter, the manufacturer, quickly purchased the invention. It was Voelter who first conceived the idea of grinding wood by stones and it is due to this development of the original machine that he is so commonly credited with having been its inventor. About 1847, having perfected his improvements, Voelter began to use the ground wood pulp, and, about two years later, the same system was adopted by the French manufacturers at Souche. The use of this material in the United States was first made by Alberto Pangenstecher, whose factory was located at Stockbridge, Mass., but, while he was very successful in making paper from ground wood, it was not put into printing-paper until 1867, when Wellington Smith, Warner Miller and William E. Russell adopted that process. Since the introduction of wood pulp, the paper industry has grown with great rapidity. Whereas, in 1850, the 500 mills, with their capitalization of about $18,000,000, were producing paper to the value of about $17,000,000 per annum, in 1870 the number of mills had increased to 669, and the annual production to $48,436,935. The following table, compiled from the last report of the United States census, shows the status of the industry since 1880:

AMERICAN PAPER INDUSTRY.

	1880	1890	1909	1914
Number of establishments	742	749	777	718
Capital	$48,139,652	$89,829,548	$409,348,505	$534,625,000
Wage earners	25,631	31,050	75,928	88,857
Wages	$8,970,133	$13,204,828	$40,804,502	$53,246,000
Value of product	57,366,860	78,937,184	267,656,964	332,147,000

In 34 years the value of the production has increased nearly six times, while the capitalization has increased 11 times. During the years from 1880 to 1900, the pound price was slowly but steadily lowered. Since then it has increased, and some grades have reached the former level.

Of the 718 factories credited to the paper industry, but 495 make paper exclusively; 63 are pulp mills, and 160 make both paper and pulp. They consume annually 4,500,000 cords of wood, mostly spruce, and one-half of this they import, chiefly from Canada. About 10 per cent of the pulp used is also imported, and 40 per cent of the sulphite fibre. Of the $213,000,000 spent for materials, $40,000,000 is for wood; $32,000,000 for sulphite, and $20,000,000 for old paper, which latter is mixed in with the new in the news print and other cheap grades of paper. Of the $332,000,000 products, that classed as book is the largest, $74,000,000, but this does not mean that this all goes into books, for this grade includes most of the magazine paper, and a large amount used for miscellaneous printing. The newspapers consume the greatest tonnage, but the quality is lower, and the annual value is about $53,000,000; however, their illustrated supplements are often printed on book paper. The wrapping paper totals $49,000,000, writing paper $29,000,000, paper board $39,000.000, tissue paper $12,000,000, building and roofing paper $10,000,000, wall paper $5,000,000, and cardboard $5,000,000. The balance of $56,000,000 is divided among the infinite variety of paper articles and objects supplied to the public.

A change in the paper industry of the United States came about shortly after 1909, owing to news print paper being put on the free tariff list. There is much more wood in Canada than remains in New England and the Central States, and labor also is cheaper there. Paper manufacturers began to invest in Canadian properties, and soon a large percentage of the American supply came from over the border. Then the World War came on, Canadian mills were short of help and curtailed production and the pulp supply from Scandinavia ceased. The result was a shortage of paper in the United States and prices went kiting. The newspapers and other publishers claimed that the manufacturers of paper squeezed the market, and an investigation followed, resulting in a fine of $2,500 being levied on each of half a dozen men prominent in the paper combine. Thereafter the government took a hand, and large users of paper were notified that they must reduce the quantity utilized from 5 to 15 per cent.

Revised by RICHARD FERRIS.

PAPER MONEY. See MONEY, PAPER.

PAPER-MOUTH, a fish. See CRAPPIE.

PAPER-NAUTILUS. See ARGONAUT.

PAPER PULP. See PAPER.

PAPHLAGONIA, păf-lạ-gō'nĭ-ạ, *in ancient geography,* a division of Asia Minor, bounded on the north by the Black Sea (*Pontus Euxinus*), on the east by the river Halys, separating it from Pontus, on the south by Galatia and on the west by Bithynia. Besides the Halys (now Kyzyl-Irmak), the waterways were the Amnias (Goek-Irmak), and the Parthenius (Bartin-Chai). The coast was fertile, the interior well wooded, game abundant, the principal industry sheep-raising, and the people famous horsemen. The region was subject nominally to Lydia, Persia and Macedonia in succession, still keeping its own actually independent princes. After Alexander's death Paphlagonia and Cappadocia became a part of Pontus, and then a Roman province. The chief city was the Greek colony of Sinope.

PAPHOS, pā'fŏs, two ancient cities on the island of Cyprus. The earlier, called «Old Paphos» (Palæpaphos) was founded by the Phœnicians on the southwest coast near the mouth of the river Bocarus, possibly in the 10th century B.C., and was the sacred city of Aphrodite, probably not the Greek goddess but the Semitic Astarte, whose famous temple, the object of pilgrimage in the pre-Christian era, is now entirely destroyed, save for a fragment of the cyclopean masonry still preserved at Kuklia, the present town. The new city (Neapaphos), 10 miles northwest of the old, was a Greek colony, of great marine and commercial importance; in Roman times it was the capital of the island; it is now called Baffo. Consult Cobham, 'Bibliography of Cyprus' (1886); Ohnefalsch-Richter, 'Kypros' (1893); Enlart, 'L'Ile de Chypre' (1897, in 'Bulletin de la Société Géographique').

PAPIAS, pä'pĭ-ạs, Christian writer, bishop of Hierapolis. He is described by Irenæus and later writers as a «hearer of John and a companion of Polycarp.» He suffered martyrdom at Pergamus in 163 A.D. He was one of the earlier believers in the millennium, that is, the personal reign of Christ on earth for a thousand years after the resurrection of the dead, and was the author of five books of commentaries on the sayings of our Lord (Λόγων Κυριακῶν 'Εξήγησςι), a few fragments of which are extant. It is from them that we learn that Saint Matthew's Gospel was traditionally believed to have been written in Hebrew, and the evangelist Mark to have been the interpreter or amanuensis of Peter in writing the Third Gospel. Consult Hall, 'Papias and His Contemporaries' (1899); Weissenbach, 'Das Papiasfragment bei Eusebius' (1874); 'Die Papiasfragmente über Marcus u. Matthäus' (1878).

PAPIER-MACHÉ, păp-ĭ-ā' mạ-shā, mashed or pulped paper made into some form other than the familiar paper sheets. It is usually mixed with glue, sizing or paste to give it greater hardness, and borax or phosphate of soda may be added as a fire resistant. It is commonly formed by forcing the pulped mixture into a mold under pressure and allowing it to dry. Wall ornaments, cornices, ceiling decorations and the like are frequently molded in papier-maché; picture frames and boxes, especially with ornamental tops as for snuff or the toilet table, or for souvenirs, are easily made in this way and may be colored or varnished at pleasure. Anatomical models and so-called wax figures may also be produced in this manner. Sometimes the papier-maché is made by pasting or gluing sheets of paper together and pressing them when soft into the form which it is desired to give them, but it is becoming more common to speak of such articles as being made simply of paper.

PAPILIO, a genus of butterflies (q.v.), popularly known as «swallow-tails» from the prolonged appendages of the posterior margin of the hind wings. The technical characters of the genus are found in the venation of the wings: internal vein of hind wing wanting, its place occupied by the submedian; median and submedian veins of fore wing united by a cross-vein, from the submedian end of which a short internal vein arises. The caterpillars are smooth and fleshy, and when disturbed protrude from the region of the thorax a pair of soft filiform «stink-horns» giving an offensive odor. The chrysalids are angulated and naked, and are suspended by a loop of silk passed about the middle and by a silken button at the caudal end. Although the imagos vary greatly, they are usually of large size and showy colors. Probably upward of 500 species are known, abounding in tropical countries; the genus is very poorly represented in Europe, but North America has nearly 30 species. Among our best known Eastern species are *P. asterias*, a handsome black and yellow form; *P. turnus*, with the wings a rich yellow bordered and barred with black, and *P. troilus*, generally rusty black with the posterior half of the hind wing greenish blue. The Ajax butterfly (*P. ajax*) is one of those interesting species which exhibit seasonal polychromatism. It sometimes resembles the Asterias. The *P. philenor* is another black species, but it lacks the yellow spots and shows a beautiful greenish reflection on the upper surface of the wings. The caterpillars of papilios are somewhat destructive to particular plants, but have not the economic importance of the cabbage butterflies (*Pieris*, etc.), which, like them, have the front legs well developed and are placed with them in the family *Papilionidæ*.

PAPILLA. See SKIN AND SKIN DISEASES.

PAPIN, pä'pĭn (Fr. pä-păṅ), **Denis**, French physicist: b. Blois, 22 Aug. 1647; d. England, about 1714. He practised medicine for a time at Paris, but turned his attention to physical sciences, assisted Huygens in the construction of the air-pump, and during a visit to England was admitted a Fellow of the Royal Society. Being a Protesant, the revocation of the Edict of Nantes prevented his return to his native country, and on leaving England he settled at Marburg, in Germany, in 1687, as professor of mathematics. But he again came to England in 1707. The real importance of Papin's many researches and experiments was long unperceived. He invented the double air-pump and the air-gun, a «digester» for cooking by means of liquids under produced atmospheric pressure, and the safety-valve, first used in the «digester.» In 1690 he constructed the first steam-engine with a piston, and in the same year a boat with a paddle wheel revolved by a water-wheel supplied by means of a pumping-engine. Consult Thurston, 'Growth of a Steam Engine' (1878); Gerland, 'Life' (1881).

PAPINEAU, pä-pē-nō, **Louis Joseph**, Canadian politician: b. Montreal, Quebec, 1786; d. Montebello, Quebec, 24 Sept. 1871. He was educated at the Seminary of Quebec, studied law and was admitted to the bar, and was elected in 1812 to the Canadian assembly. During the War of 1812 he was captain of militia, and in 1815 he was elected speaker, which office he held for over 20 years as leader of the French-Canadian party. He was continually at variance with the royal governors and in 1827 Lord Dalhousie adjourned Parliament and resigned rather than allow Papineau to take his seat as speaker. He disapproved the union of Upper and Lower Canada, and in 1834 framed the «Ninety-two Resolutions» which were sent to England in exposition of the grievance and demands of his compatriots. In 1834 he consulted with William Mackenzie, the revolutionary leader of Upper Canada, regarding the consolidation of their forces. In 1837 he attended the meeting in which a revolution was decided upon, and a warrant was issued for his arrest for high treason, though he had fled to the United States at the outbreak of the rebellion. He escaped to France, but was pardoned in 1845 and returned to Canada. He again entered Parliament in 1847, but finding himself without influence retired in 1854. Consult De Celles, 'Louis Joseph Papineau' (in Makers of Canada series, 1910); Read, 'The Canadian Rebellion of 1837' (1896); Kingsford, 'History of Canada' (1887–98).

PAPINI, pą-pē'nē, **Giovanni**, Italian philosopher: b. Florence, 1881. In his native city he founded a review, *Leonardo*, of which he became editor and to which he contributed several articles under the *nom de guerre* of Gian Falco. His philosophy is purely pragmatism, of which he is the ablest living exponent in his country. His published works are 'Il crepuscolo dei filosofi'; 'La coltura italiana'; 'Il tragico quotidiano: favole e colloqui' (1906); 'Il pilota cieco' (1907); 'L'Altra metà: saggio di filosofia mefistofelica' (1911); 'Le memorie d'Iddio' (1911).

PAPINIANUS, pą-pĭn-ĭ-ā'nŭs, **Æmilius**, Roman jurist: b. about 146 A.D.; d. 212. He accompanied the Emperor Septimius Severus as prætorian prefect to Britain and was put to death by Caracalla. Papinianus was the chief of all the Roman jurists. His most important writings were his 37 books of 'Quæstiones' (legal questions) and 19 of 'Responsa' (decisions). A few fragmentary portions exist as excerpts. These works were, until the preparation of the Pandects by Justinian, the main repository of jurisprudence connected with the exposition of original authorities. In the Pandects (q.v.) many extracts from him appear, forming about one-twelfth of the total number there given. Consult Brinz, 'Die Berliner Fragmente vorjustinianischer Rechtsquellen' (1884).

PAPPENHEIM, päp'pĕn-hīm, **Gottfried Heinrich**, COUNT. German military officer: b. Franconia, Germany, 29 May 1594; d. Leipzig, Germany, 17 Nov. 1632. He was educated at Altdorf and Tübingen, entered the army and as a colonel in the battle of Prague, 1620, was distinguished for his bravery. In 1623 he was appointed by the emperor to the command of a regiment with which he served in Lombardy until 1625, and in 1626 he crushed an insurrection in Upper Austria in which 40,000 peasants were killed by his forces. At Magdeburg with General Tilly in 1630 he is charged with great cruelty; he fought with Wallenstein at Leipzig in 1631, and was fatally wounded at the battle of Lützen in 1632. He was a man of indomitable courage, but rash and impetuous. Consult Hess, 'Gottfried Pappenheim' (1855).

PAPPUS, Greek mathematician. He lived at Alexandria toward the end of the 3d century of the present era. His great work, ‘A Mathematical Collection,’ is the source of all our knowledge of ancient Greek mathematics. Only a mutilated portion of the original eight books is extant and this contains, besides geometrical problems and theorems, an essay on mechanics. These fragments were published by Hultsch at Berlin in 1876–78.

PAPPUS, the downy appendage that crowns many single-seeded seed-vessels, such as the down of the dandelion, etc. It represents the calyx of the flower and may be pilose, with the threads unbranched, or plumose, with feathery threads; sessile, with the threads resting directly on the achenes; or it may be supported on a longer or shorter beak. It acts as a parachute in directing the fruit when it becomes separated from the parent plant. The term pappus may also be applied to other forms of a persistent calyx, as a crown or a circlet of scales.

PAPUA. See New Guinea.

PAPUAN SUBREGION, a faunistic subdivision of the Australian Region which embraces the mountainous, heavily forested islands of the Papuan Archipelago, north of Australia. See Zoogeography.

PAPYRUS. The word is derived from the Greek παπυρος, a reed plant known as *cyperus papyrus* or *papyrus antiquorum,* belonging to the family *cyperaceæ* (sedges). Its prolific growth in Egypt was utilized by the natives in ancient times for making a medium on which to write, also from its bark were made cordage and sails and its roots were used as fuel. Papyrus has been used as a medium for writing on from the very earliest antiquity; some specimens of papyrus documents found in Egypt are attributed to the third dynasty (4,000 years before our era). The ancient papyrus writings of the Egyptians are in several kinds of script: hieroglyphic, hieratic and demotic. Theophrastus (3d century B.C.) describes the Egyptian method of manufacturing paper from this plant. The stem was cut into two equal parts, from which, when the outward rind or bark was taken off, they separated the thin film, of which the stem is composed, with a sharp-pointed instrument. The pellicles or thin coats, being flaked from the stalk, they laid upon a table two or more over each other transversely and glued them together, either with the muddy and gelatinous water of the Nile, or with fine paste made of wheat flour; after being pressed and dried they made them smooth with a roller, or sometimes they rubbed them over with a solid glass hemisphere. These operations constituted the Egyptian papyrus as far as the art of making it has been discovered. The size of this paper seldom exceeded two feet in length, but it was often smaller; it had different names, according to its size and quality. The largest was termed «Imperial,» which was also the finest quality. This was used for letter paper by the more prominent Romans. The next kind the Romans termed «Livian» paper and it was named after Livia, wife of Augustus; this kind measured 12 inches each leaf. A third kind was named «sacerdotal» and its size was 11 inches. The papyrus in use in the amphitheatre was nine inches in size. This writing material became so popular among the ancient nations that its production became the chief article of commerce of Egypt, Alexandria being its chief centre. Many ancient manuscripts (called *diplomas* in paleography) have been unearthed in Egypt, especially at Fayoum (see Manuscripts). The papyrus plant and the documents written on this medium were both termed *charta* by the Romans. When the Egyptian manufacture of papyrus was at its greatest commercial height (it had become a monopoly) each leaf had to be marked with a stamp to maintain its authenticity and value. The Egyptians generally made it up in a roll (*volumen*), in lengths up to 46 feet and a width never exceeding 10 inches. The papyrus that was in use in Europe was of Egyptian importation up to the end of the 10th century. For a long period all diplomatic instruments were written on papyrus because of its beauty and adaptability, the sheets being fastened together to any required length. Parchment gradually superseded papyrus in the 7th century, and the discovery of paper-making lessened the demand for papyrus still more. Paper was made in Egypt probably as early as 600 A.D. from cotton. The pontifical chancellery, till the middle of the 12th century, used papyrus in issuing its bulls; the Merovingian kings wrote their documents on papyrus all through the 7th century; and we find in France documents inscribed on papyrus up to the end of the 8th century. While papyrus was poorly fitted for use as book (*codex*) pages and made up into a roll (*volumen*) for this reason, we find, in the Merovingian period, papyrus made up into pages to form books, but frequently intercalated with a leaf of parchment between the *gatherings* to give solidity and consistence to the work. After the collapse of the Egyptian papyrus factories Sicily continued to manufacture the material for papal use; but this product was of inferior quality as is seen in examining the last papal bulls on this material. Very many ancient volumina of papyrus have been brought to light in modern times; no less than 150 rolls were found in a chest in the ruins of Herculaneum in 1754; they are so badly charred as to be, for the most part, too brittle to allow unrolling. The Grecian papyri found in Egypt (a great number at Arsenoë, capital of Fayoum) are, in large numbers, in the museums of Vienna, London, Berlin, Paris, Petrograd, Cairo, etc. The largest known papyrus roll is that found in 1855 behind Modinet Habu, on the Nile. It is in the British Museum and facsimiles with translations were published by the trustees in 1876. The volumina are of greatly varying lengths; the Harris papyrus measures over 131 feet and is in London; the medical papyrus of Ebers, in Leipzig, is over 65 feet. The rolls are found inscribed in Egyptian, Greek, Latin, Arabic, Hebrew and Syrian. See Paper; Vellum; Parchment, etc.

Clement W. Coumbe.

PARÁ, pä-rä′, **GRAN PARÁ,** or **GRÃO PARÁ,** growṅ pä-rä′, maritime state of the Brazilian Confederation, lying on either side of the Amazon, bounded on the north by the Guianas (except Brazilian Guiana, a part of Pará) and the Atlantic, on the east by the Atlantic and the states of Goyaz and Maranhão, on the south by Matto Grosso and on the west by Amazonas. Its area is 443,903 square miles. It has mountain ranges and plateaus on its interior boundaries, but its most striking physical characteristic is its great alluvial plain traversed by the lower waters of the Amazon and Tocantins systems, so that the state is unusually fertile and has remarkable facilities for commerce and transportation. There are settlements on nearly all the rivers: San Jose on the Jary, Almeirin on the Paru, Cametá on the Tocantins, Souzel, Porto de Moz and Villarinho on the Xingu, Santarem on the Tapajoz, Obidos on the Trombetas, Macapá on the mouth of the Amazon and Pará or Belem on the Pará. The india rubber trade, which is now valued at $35,000,000 a year, is building up towns in the interior away from the rivers. Cacao, vanilla, sarsaparilla, coffee, sugar, hides, copaiba and Brazil nuts are the other leading products and exports of the state, which probably has large mineral wealth awaiting capital. The climate is equable and comparatively healthful in spite of the floods along the river courses. The only railroad is from the capital, Pará (q.v.), to the coast. Pop. about 568,000.

PARÁ (originally SANTA MARIA DE BELEM, that is, Saint Mary of Bethlehem; and hence called BELEM, the present official name), Brazil, capital city of the state of Pará, lying northeast of Rio Janeiro on the Rio de Pará, south of the island of Marajo, 55 miles from the Atlantic. It is connected with Bragança on the coast nearly 80 miles distant by a railway, and is an important port, the only one of the state; it has regular steamboat connections with Brazilian, European and North American ports, and is the seat of a United States consul. An episcopal city, it has a cathedral built in 1720, when the city was in its 106th year, a government palace, a library, lyceum, theatre, botanical garden, two seminaries, electric street railroads, electricity and gas lighting. There are several banks. Pará is the greatest rubber shipping port in the world; of approximate annual exports of $39,000,000, $35,000,000 are for rubber. Cacao, Brazil nuts and hides are among the other exports. Imports are valued at $16,000,000. The city is cosmopolitan, and most of the whites are Portuguese. Pop. 200,000.

PARÁ, Rio de, arm of the sea, forming the embouchure of the Tocantins River on the northeast coast of Brazil, near the mouth of the Amazon, from which it is separated by Marajo Island. The island's southwestern boundary, the Paranan, carries some of the water of the Amazon to the Pará. The two rivers were no doubt formerly connected even more closely. The Pará is 138 miles long, 20 miles wide opposite the city of Pará and 40 miles wide at the mouth. It gives its name (which originally meant "river," and occurs in so many compounds, for example, Paraguay, Parana, Paranan, Paranagua) to the state and city of Pará.

PARA, a Turkish and Egyptian coin, the 40th part of a piastre, valued at one-fifth of a cent.

PARA, or ASSAI, PALM. See PALMS.

PARABLE, a fictitious narrative, usually brief, intended to illustrate some point in moral or religious teaching. As used by the ancient Greeks it meant any literary illustration. The parable is, therefore, of the class of fictitious narratives of which the simile, myth, fable and allegory are other examples. (See SPEECH, FIGURES OF). In the Bible the parable is frequently used to illustrate the teacher's meaning. The descriptions in the Biblical parable keep well within the limits of natural probability and always has for object some spiritual motive with a scope limited to inculcating a single lesson. The parables of Jesus were uttered to illustrate religious truth and in some instances to veil it, as in the parable of the sower (Matt. xiii, 8–23), in which the responsibilitv of apperceiving and applying the lesson is thrown upon the auditor. The word *parable* occurs 48 times in the Four Gospels and but twice elsewhere in the New Testament. Commentators have essayed the classification of the Bible parables into theoretical, parables of grace, prophetic or judicial, etc. Consult Bruce, A. B., 'The Parabolic Teaching of Christ' (4th ed., New York 1911); Dods, M., 'Parables of Our Lord' (2 vols., ib. 1912); Lithgow, R. M., 'Parabolic Gospel' (ib. 1914); Guthrie, T., 'The Parables' (London 1866); Trench, R. C. T., 'Notes on the Parables of Our Lord' (New York 1882); Winterbotham, 'The Kingdom of Heaven' (ib. 1898).

PARABOLA, *in mathematics,* a plane curve and that one of the conic sections obtained by cutting the surface of a cone with a circular base by a plane parallel to one of the elements. Its characteristic property is that every point therein is equidistant from a given point called the focus, and a given straight line called the directrix.

Construction by Points.— (See Fig. 2). Let F be the focus and the line DN the directrix, and draw FD perpendicular to the directrix. The point A, midway between F and D, will be on the curve, by definition, and is called the vertex. Take any distance $DM > DA$, draw PMP' perpendicular to DF, and, with F as a centre and DM as a radius, describe an arc. This arc will intersect PMP' in two points, P and P', which will give two points on the parabola. Proof: $FP = DM = PN \therefore P$ is on the parabola by definition.

Construction by Continuous Motion (See Fig. 2).— Fasten a string at S, one end of a right triangle, and the other end at F, making the length $SPF = SN$. With the triangle in any position, with the short side against a straight edge on DN, bring the string taut against the triangle with a pencil point at P. Move the triangle along the straight edge, that is, along the directrix, keeping the string taut and the pencil-point against the moving triangle. The pencil will trace the parabola, since in every position $PF = PN$.

History.— The parabola is, with the exception of the circle, the oldest of the historic curves, tradition ascribing its discovery to the Greek mathematician Menæchmus (350–330 B.C.), as incident to an attempt to solve the problem of the two mean proportionals, to which the famous Delian problem of the duplication of the cube has been reduced by Hippocrates of Chios. The object of this problem is to find two quantities, x and y, such that $a : x = x : y = y : b$, which requires that the equations $x^2 = ay$ and $y^2 = bx$ shall be satisfied simultaneously. Since these are equations of parabolas, the problem requires the determination of the co-ordinate of the point of intersection of the two curves. The parabola is also remarkable as the first curve whose area, included between the curve and any chord, was obtained. This is considered to be the greatest mathematical achievement of Archimedes (287–212 B.C.), introducing the "method of exhaustions," in many respects the same as that of the integral calculus. The parabola occurs frequently in the arts and sciences. The cables of a suspension bridge loaded uniformly hang in a parabola; the path of an unresisted projectile, as a cannon ball or a watersprout, is a parabola; railway curves are frequently parabolas; and beams loaded in particular ways often bend into parabolic shapes.

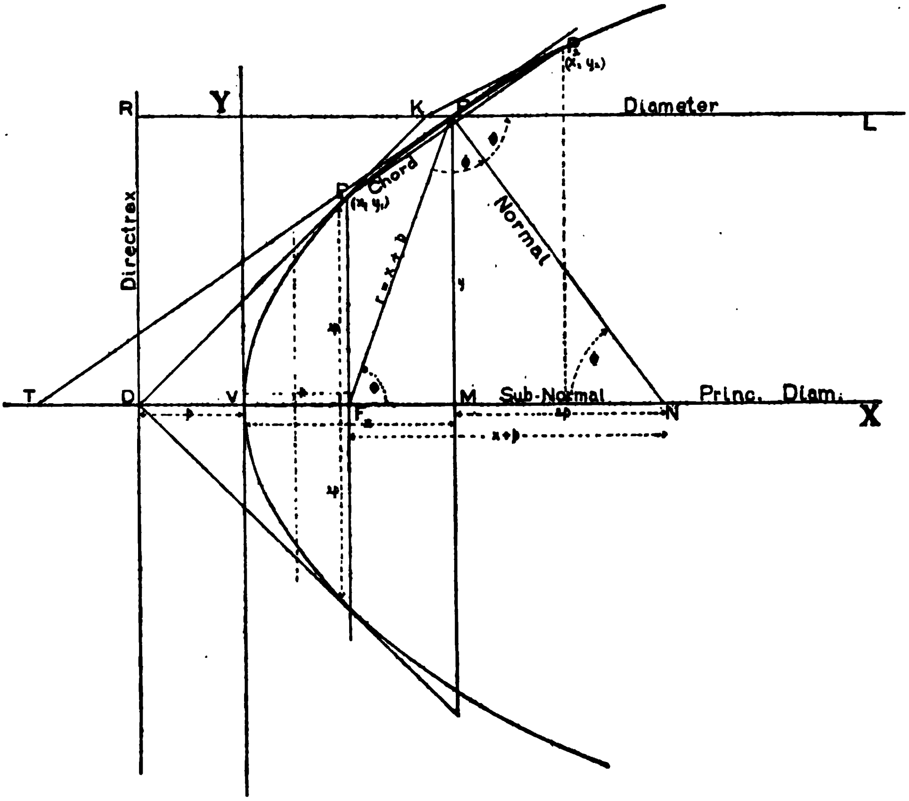


FIG. 1.

Equation of the Parabola in Cartesian Co-ordinates.— The normal or simplest form of the equation is obtained by assuming the principal axes, that is, the line through the focus perpendicular to the directrix, as the X-axes and the tangent at the vertex as the Y-axes. (See Fig. 1). Denote the co-ordinates of any point P by (x, y), and the distance VF by p. Then $FP^2 = (x-p)^2 + y^2$ and $VP = DM = x + p$ and $(x+p)^2 = (x-p)^2 + y^2$, which reduces to the equation of the parabola in the standard form (1) $y^2 = 4px$.

Equation of the Parabola in Polar Co-ordinates.— Assuming F as the pole and r and θ as the co-ordinates of P, we have $y = r \sin \theta$ and $x = p + r \cos \theta$; substituting these values in (1) and solving for r we find as the polar equation of the curve (2) $r = \dfrac{2p}{1 - \cos \theta}$.

Diameter of the Parabola.— A diameter of any curve is defined to be the locus of the middle points of a system of parallel chords.

Let (x_1, y_1) and (x_2, y_2) be the co-ordinates of P, and P₂ the extremities of the chord P₁ P₂ (Fig. 2) and (x, y) the co-ordinates of the middle point. Since $y_1^2 = 4px_1$ and $y_2^2 = 4px_2$, $\dfrac{y_2 - y_1}{x_2 - x_1} = \dfrac{4p}{y_2 + y_1} = \dfrac{2p}{y} = m$, where m is the slope of the chord. That is, the equation of a diameter is $y = \dfrac{2p}{m}$, which proves every diameter to be parallel to the principal diameter, whose equation is $y = 0$. This occurs when $m = \tan \dfrac{\pi}{2} = \infty$, showing the principal axes as bisector of its chords at right angles.

Equation of the Tangent.— Since the secant $\dfrac{y - y_1}{x - x_1} = \dfrac{4p}{y_2 + y_1}$ becomes $\dfrac{y - y_1}{x - x_1} = \dfrac{2p}{y_1}$ when $y_2 = y_1$ the equation of the tangent, defined as the limiting position of the secant as P₂ approaches P₁, reduces to the form (3) $yy_1 = 2p\ (x + x_1)$. The right line $y = mx + b$ intersects the parabola $y^2=4px$ in general in two points, determined by $x=\frac{1}{m^2}(bm-2p)\pm 2\sqrt{p^2-bpm}$. These become coincident when $b=\frac{p}{m}$, affording as the equation of the tangent in terms of its slope, (4) $y=mx+\frac{p}{m}$. By transformation of co-ordinates, the equation of the parabola referred to any diameter and the tangent as its extremity may be shown to retain

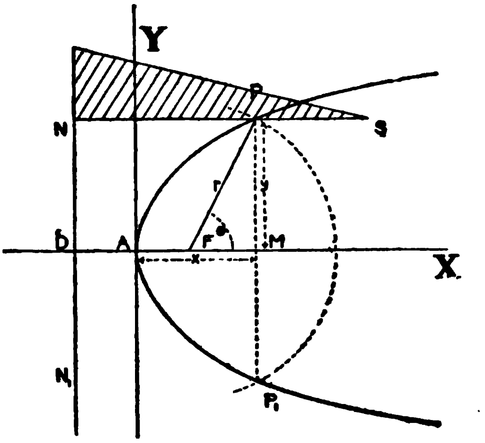


FIG. 2.

the normal form (5) $y'^2=4px'$, and it follows that (3) will also retain the same form. By assuming y or y', as the case may be, equal to zero we find the x intercept of the tangent equal to x or x', that is, the sub-tangent is bisected at the vertex.

To Construct a Tangent.— By virtue of the foregoing property, when the point is on the curve, construct the ordinate of the point and lay off the length of the abscissa to the left of the vertex. Connect this point on the diameter with the point on the curve. If the point is outside the curve, draw the diameter of the curve through the point, lay off the distance measured on this diameter from the point to the curve to the right of the temporary vertex, and draw the chord through the point thus determined parallel to the tangent at the temporary vertex. The line through the points in which this chord cuts the curve and the given point will be the required tangents.

The Normal.— Since the normal is the perpendicular to the tangent at the point of tangency, its equation becomes (6) $y-y_1=-\frac{y_1}{2p}(x-x_1)$, which cuts the axis at the point $2p+x_1$.

The Subnormal is, therefore, constant and equal to $2p$. This property enables us to construct the directrix and the focus by laying off p to the left and to the right of the vertex, p being obtained by bisecting the subnormal. The focal radius $FP=FN=x_1+p$, whence the angle FNP = the angle NPL; that is, the normal bisects the angle between the focal radius and the diameter through any point. This property causes rays of light at the focus to be reflected in parallel rays and is made use of in parabolic reflectors. The two tangents $y=mx+\frac{p}{m}$ and $y=\frac{1}{m}x-pm$ are perpendicular and intersect at the point whose abscissa is p; that is, perpendicular tangents intersect on the directrix.

The Latus Rectum is the double ordinate through the focus and is equal to 4p. The tangents constructed at the extremities of the latus rectum intersect on the directrix, and are, therefore, at right angles. The area of the parabola included between any chord and the curve is given by the formula

$$\text{area}=2\sin\theta\int_0^{x'}y'\,dx'=$$

$$2\sqrt{2p}\sin\theta\int_0^{x'}x'^{\frac{1}{2}}dx'=\frac{4}{3}\sin\theta.\ (2p)\frac{1}{2}x'^{\frac{3}{2}}=$$

$\frac{4}{3}$ of the area of the parallelogram constructed with the chord and x' as its sides.

Rectification of Parabola.— The length of a parabolic arc is obtained as follows (see CALCULUS):

$$S=\int[1+\left(\frac{dx}{dy}\right)^2]^{\frac{1}{2}}dy=\frac{1}{p^2}y\sqrt{y^2+p^2}+$$

$$\frac{p}{2}\log\left(y+\sqrt{y^2+p^2}\right)+C.$$

If the arc begins at the vertex, then $s=0$ when

$$y=0 \text{ or } 0=\frac{p}{2}\log p+c_1 \text{ whence}$$

$$S=\frac{1}{2p}y\sqrt{y^2+p^2}+\frac{p}{2}\log\frac{y+\sqrt{y^2+p^2}}{p}.$$

Radius of Curvature.—The radius of curvature of the parabola at the point (x, y) is given by the formula

$$R=\pm\frac{[1-\left(\frac{dy}{dx}\right)^2]^{\frac{3}{2}}}{\frac{d^2y}{dx^2}}=\pm\frac{\left(1+\frac{p^2}{y^2}\right)^{\frac{3}{2}}}{-\frac{p^2}{y^3}}=\pm\frac{(p^2+y^2)^{\frac{3}{2}}}{p^2}.$$

J. BRACE CHITTENDEN, Ph.D.

PARABOLANI, men whose duty in the early Church was to attend on the sick and diseased. The term was originally applied to gladiators, and is derived from the Greek *parabolos*, reckless, in allusion to the courage with which these laymen nursed those who suffered from infectious diseases. Such functionaries were attached to all the principal churches of the East, and at Alexandria they formed a corps of 500 men. Theodosius the younger increased this number to 600, because plagues and contagious diseases were common in Egypt. This emperor placed them under the jurisdiction of the chief magistrate, but they were appointed by the bishop, whose directions they were bound to follow. As the parabolani were bold and indifferent to death, laws were enacted to prevent them from exciting seditions which were particularly common at Alexandria. Their number was limited by Theodosius, and they were forbidden to attend at public assemblies and courts of justice, unless they had some business there sanctioned by the law. More than once they showed themselves deserving of suspicion, as for example at the Council of Ephesus in 449, when a Syrian monk named Barsumas, at the head of a band of armed parabolani, committed outrageous excesses and terrified the council into granting his demands.

PARABOLOID, *in geometry,* a solid figure traced out by a parabola revolving round its principal axis. It is a characteristic property of paraboloids that they have no centres except in the extreme cases, when they have an infinite number of centres. There are three varieties of paraboloids, elliptical, hyperbolic and parabolic.

PARACATU, pä-rä-kä-too', Brazil, town in the eastern part of the state of Minas Geraes, 450 miles northwest of Rio Janeiro, on the river of the same name, which is an affluent of the São Francisco. The city dates from the middle of the 18th century, in which it was the centre of a rich auriferous district. The gold-washings are no longer of value; cattle, hides, sugar-cane and coffee are its important products. Pop. about 15,000.

PARACELSUS, pär-ą-sel'sŭs (Philippus Aureolus Theophrastus Bombastus von Hohenheim), Swiss physician, chemist, and charlatan: b. Maria-Einsiedeln, Canton Schwyz, 17 Dec. 1493; d. Salzburg, 23 Sept. 1541. He acquired considerable real knowledge of medicine and chemistry, but spent his time in searching for a universal specific and the philosopher's stone. In his wide travels, extended to the East, he derived, in addition to the arts of alchemy and magic, a knowledge of certain remedies not then familiar to Continental physicians, and by this means effected numerous cures which brought him high prestige. In 1526 he became professor of medicine in the University of Basel, and there he burned publicly the works of Avicenna and Galen and declared himself the monarch of physic. He drew about him a school known as the Paracelsists, and claimed among his discoveries that of indefinitely prolonging life. In 1528, owing to a quarrel with the magistracy, he left Basel for a wandering existence in Switzerland, Alsace and southern Germany. His methods of puffing long prevented a just estimate of him; but he is now seen to have enriched medicine and chemistry, and especially to have made great contributions to, if not to have founded, modern pharmaceutics. A complete edition of his works (Latin) appeared at Basel in 1589. Consult the 'Life' by Hartmann (1887).

PARACHUTE, a mechanism of an umbrella shape, about 20 or 30 feet in diameter, attached to balloons, by means of which the aeronaut may descend slowly from a great height. It has a hole at the top to prevent oscillation. In 1783 the French physician Lenormand made several experiments with parachutes of 30 inches in diameter at Montpellier; and shorty after the machine (enlarged to something like its present dimensions) became well known through the public descents of Blanchard in Paris and London. Garnerin was the first to suggest their use for balloonists in case of accident. See Balloon.

PARACLETE (*parakletos,* a counselor; encourager, admonisher or comforter), in the English translation of the Bible, the Comforter, the Holy Ghost. Jesus promised to his disciples (John xiv, 16) that his Father would send them another Comforter, the Spirit of Truth, who would abide with them forever, teach them all things (ver. 26), and bring all his sayings to their remembrance. It is also the name of a monastery near Troyes which Abelard founded and where he was buried.

PARADIN, a vegetable poison. See Herb Paris.

PARADISE, the garden of Eden. The word is originally Persian and signifies a park. It has been introduced into modern languages as a name for the garden of Eden (see Eden) and hence of any abode of happiness. In general, the heavenly abode of the blest. Numerous scripture passages refer to Paradise as the equivalent of heaven, a place where those who die in the Lord shall dwell with him forever. No very definite conclusion can be drawn by considering the very numerous Bible references, but Milton typified the popular idea in his 'Paradise Lost' (q.v.). Some sects undertake to dogmatize concerning Paradise as the place where the souls of the righteous await the final resurrection and entry into heaven. But science recognizes neither Paradise nor heaven. The Mohammedan idea of Paradise is that of a beautiful watered area — the opposite of a desert — inhabited by celestial beings of both sexes, who take their fill of sensual delights. The Puritanical idea seems to have been a place where saints and angels mingle and spend most of their time playing harps and singing the praises of the Deity. All sorts of conceptions between these two have been advanced, and many learned theologians have written voluminously on the topic, but without adding to the sum of the world's knowledge of life beyond the grave. According to the accounts in Genesis II, Exodus III, Numbers XIII, Paradise was a place of mountains, with four rivers flowing with milk and honey. Some texts indicate an earthly location, as those in Genesis, but generally it appears as a heavenly region. Consult Salmond, 'The Christian Doctrine of Immmortality' (1895); Sharman, H. B., 'Teaching of Jesus About the Future' (1909); Dobschutz, E. A., 'Eschatology of the Gospels' (1910).

PARADISE-BIRD. See Birds of Paradise.

PARADISE FISH, or **FISH OF PARADISE,** small Oriental fish (*Polyacanthus viridicaudatus*) allied to the climbing-perch (*Anabas*), which belongs naturally in the fresh-water streams, and is extensively bred in aquariums by the Chinese, on account of its brilliant coloring. Fantastic varieties, with greatly extended and modified fins and tail, have been developed.

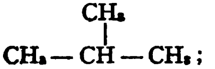
PARADISE LOST, a blank verse epic in 12 books, was composed by John Milton in blindness between the years 1658 and 1665 and published in 1667. Originally conceived, in dra-

PARAFFIN (Latin, *parum affinis,* without affinity), a white, waxlike substance, solid at ordinary temperatures, which may be obtained by the distillation of carbonaceous materials, or of oily or coal-bearing shales. Crude petroleum oil is now the chief source of the commercial supply of paraffin. The oil is subjected to a process of fractional distillation, by which naphtha, kerosene, light mineral oil and heavy mineral oil are successively obtained. The distillation is usually carried on until further application of heat would be likely to cause carbonization; and the paraffin is then left in the heaviest, least volatile portions. When the process is correctly conducted, the paraffin crystallizes out when the heaviest oil is allowed to stand in the cold; and it is afterward purified by washing with benzine and by such further treatment as may be required. Paraffin is somewhat lighter than water, is insoluble in nearly all of the ordinary solvents and is not affected readily by acids or alkalies. It is not a definite chemical substance, but consists of a mixture of hydrocarbons in varying proportions — chiefly of those designated as «paraffins» (q.v.). It melts readily and without decomposition, but its melting point varies with its composition and may range from 120° F. to about 200° F. It is greatly used for making candles, either alone or when mixed with a small proportion of stearin. It is also used in quantity for coating acid tanks, for waterproofing paper and other fabrics, for producing a high gloss in fine laundry work, and is an excellent electrical insulator, being used for impregnating the cotton coverings of electrical conductors, rendering the cotton impervious to moisture. The method of waterproofing paper with paraffin is interesting. A roll of paper is led through a trough of melted paraffin and then passed between rollers to preserve an even surface. Sometimes a knife or scraper contacts the wrong side of the paper, on which little or no paraffin is desired. Paraffin is often called «paraffin wax.» See PARAFFINS.

PARAFFINS, *in chemistry,* the series of hydrocarbons that have the general formula $C_n H_{2n+2}$. They are all distinguished by a marked chemical inertness and derive their name from this circumstance. (Compare PARAFFIN). The paraffins occur in nature in petroleum oil and they are also obtained by the destructive distillation of coal, peat, carbonaceous shale and numerous other substances. They may be roughly separated, from petroleum, by fractional distillation; but their exact separation, when mixed in such a general manner, is attended by the greatest difficulty. Many of them may be prepared, however, by heating the iodides of the alcoholic radicals with metallic zinc. Ethane (C_2H_6), for example, may be obtained by treating metallic zinc with iodide of methyl, CH_3I; the reaction in this case being $Zn + 2CH_3I = C_2H_6 + ZnI_2$. The best known of the paraffins are as follows, the temperatures opposite them being their boiling points:

Methane	CH_4	(Gaseous)
Ethane	C_2H_6	"
Propane	C_3H_8	"
Butane	C_4H_{10}	34° F.
Pentane	C_5H_{12}	100°
Hexane	C_6H_{14}	158° F.
Heptane	C_7H_{16}	210°
Octane	C_8H_{18}	255°
Dodecane	$C_{12}H_{26}$	396°
Hecdecane	$C_{16}H_{34}$	532°

The paraffins belong to the fatty series of hydrocarbons (see FATTY COMPOUNDS), and their constitutional formulæ, therefore, consist entirely of open chains, though these chains may be branched, as will presently appear. The formula for propane, for example, may be written $CH_3 — CH_2 — CH_3$. Any one of the paraffins may be regarded, from a structural point of view, as derived from the preceding number of the series by substituting the radical methyl (CH_3) for a hydrogen atom. Thus if one of the hydrogen atoms in the right-hand methyl group of the foregoing formula for propane be itself replaced by CH_3, we shall have the new compound $CH_3 — CH_2 — CH_2 — CH_3$, which is butane. A paraffin which contains only two methyl radicals is said to be a «normal paraffin»; and in the table of boiling points given above, the corresponding paraffins are all supposed to be «normal.» Methane, ethane and propane are not capable of existing in any but the «normal» form; but the higher paraffins may also exist in isomeric forms. In introducing the methyl radical in propane, for example, we replaced one of the hydrogen atoms in the right-hand CH_3 group; but we might equally well have replaced one of those in the central CH_2 group, and in that case the resulting compound would have had the structural formula



$$\begin{array}{c} CH_3 \\ | \\ CH_3 — CH — CH_3 ; \end{array}$$

and while this compound still has the empirical formula C_4H_{10}, and is still known as «butane,» there is obviously no reason for supposing that it would have the same physical and chemical properties as the butane which contains only two methyl groups. There are, in fact, two butanes known. One of these («normal butane») boils at 34° F., has a specific gravity of 0.600, and may be prepared by the action of zinc upon ethyl iodide at 300° F. The other (known as «iso-butane,» «trimethyl-methane» or «secondary butane») boils at about 3° F. and may be prepared by heating aluminum chloride with iso-butyl iodide; the iso-butyl iodide being prepared by the action of hydriodic acid upon iso-butyl alcohol, which, in turn, is obtained by the fermentive action of «Bacillus butylicus» upon sugar or glycerine. The higher members of the paraffin series admit of an increasingly great number of isomeric modifications, many of which have not yet been studied, nor even prepared. Dodecane, for example, may exist in as many as 355 different isomeric modifications.

PARAGUA, pä-rä'gwä, Philippines, a province including the part of the island of Palawan that lies north of the 10th parallel of latitude, the Calamianes Islands (q.v.) and the Cuyo Islands (q.v.); area of the mainland, 1,366 square miles, with the dependent islands, 1,635 square miles. The mainland of Paragua is mountainous, the central mountain range of Palawan extending from northeast to southwest; the rivers are numerous but short, as in the rest of the island. The staple crops are tobacco, rice, sugar and vegetables, but nothing is raised for export; the forests are valuable and extensive; and gold, lead and other minerals are found. The most important industries are stock-raising and the gathering of edible birds' nests. Cowries are also gathered in the islands and exported. The only mechanical industry is the weaving of textiles for home use. Civil government was established in this province in 1902 and the capital located at Cuyo, island of Cuyo. Pop. of the entire province, 49,850; of the mainland, 25,000.

PARAGUARI, pā-rä-kwä-rē', Paraguay, department and capital city of the department in southern Paraguay. The city, 35 miles southeast of Asunción, is situated on an eminence overlooking a tributary of Lake Ipoa, and is on the railroad between Asunción and Encarnación. There is much trade in tobacco from Villa Rica and the surrounding country. The city, founded in 1775, was the scene in 1811 of a victory over an invading army from Argentina. Its growth has been remarkable. Pop. 10,000.

PARAGUAY. A country of South America, enclosed between Brazil, Argentina and Bolivia. Estimates of the total area range between 122,000 square miles and 196,000 square miles. The chairman of the delegation of Paraguay to the first Pan-American Financial Conference estimated the superficial area at 445,000 square kilometers; the Pan-American Union handbooks give 507,640 square kilometers, or 196,000 square miles.

National Boundaries, etc.— The country is divided into two sections by the Paraguay River, the eastern section being called El Paraguay Oriental and the western El Gran Chaco or El Paraguay Occidental. On the north it is bounded by Bolivia and Brazil; on the east and southeast by Brazil and Argentina; on the south and west by Argentina.

A consequence of the government's efforts to encourage immigration and colonization is seen in the establishment of the following colonies: Villa Hayes Colony, nearly opposite Asunción in El Gran Chaco, settled by families from Switzerland, France, Italy, Belgium, Germany, Austria and Spain; San Bernardino Colony, settled principally by Germans; Colonia Nacional, on the railway from the capital to Villa Encarnación; Nueva Alemania Colony, in the department of San Pedro; Elisa, or San Antonia Colony, in the department of San Lorenzo de la Frontera; Nueva Australia Colony, containing Australians, English and Paraguayans; Colonia Cosme, in the department of Caazapá, also inhabited by Australians; Colonia Guillermo Tell, a Swiss settlement; and the Hohenau Colony, a small community of German, Brazilian and Paraguayan coffee planters.

Topography and Hydrography.— The general level of the Chaco and the lowlands of the western part of El Paraguay Oriental is approximately 250 or 300 feet above that of the sea; the eastern side of Paraguay is, however, much higher, with the exception of the extreme southeast, which is a low-lying, swampy region. An extension of the plateau or highlands of Brazil is seen in the northeast, the so-called Sierra of Amambay, with lateral spurs running toward the Paraguay River. Through the centre of the country, from Villa Encarnación toward the northeast, run the cordillera of Villa Rica and the Caaguazú Mountains; and a transverse range, crossing the Paraná River into Brazil, forms the great cataract of Guayrá. These ranges have an elevation above sea-level of 1,500 to 2,000 feet. The position of Paraguay Oriental has been aptly compared with that of the State of Illinois, for its southern boundary is at the confluence of two great rivers, and more than 800 miles above Buenos Aires and the La Plata estuary. Of these rivers, one, the Paraguay, forms the western boundary below Asunción, while, above the capital, it passes between the eastern and western divisions of the republic, as already stated; the other, the Paraná, separates Paraguay from the Argentine republic and Brazil on the south and southeast. A large part of the territory lying between these great streams is not yet well known. The Pilcomayo River, flowing southeastward from Bolivia, forming the southern boundary of Gran Chaco, and joining the Paraguay below Asunción, is navigable for a distance of 150 miles from its mouth. The Paraná flows 1,367 miles from its source in Goyaz, Brazil, before uniting with the Paraguay; the latter is about 1,800 miles long; both have large tributaries in Paraguay Oriental.

Mineral Resources and Soils.— The northern part of Paraguay is covered with limestone, while the southern is of sandstone formation. Marble is reported as abundant in the north, iron in the south. Several veins of copper have been found. Other minerals, according to semiofficial statements, are kaolin (in the departments of Caápucú, Ibicuí, Quiqlio, Villa Rica, Cordillera, Villeta and Luque); talc; graphite; serpentine stone; basalt (near Villa Encarnación); manganese in several deposits that are thought to be extensive. There are four distinct varieties of soil, namely, (1) sandy, either white or red, the latter being fertile; (2) a good argicultural soil, consisting of clay and quartz, oxide of iron, lime and miscellaneous substances; (3) humus, characteristic of forest lands; and (4) the black alluvial deposits, prevailing in western Paraguay.

Climate.— Paraguay is regarded as a sanitarium by the inhabitants of some of the neighboring countries; and it is quite true that the capital and its suburbs are moderately healthful. The mean temperature at Asunción is about the same as that of Cairo, Egypt; Hongkong, China; and Caracas, Venezuela, while the mountainous interior regions are decidedly cooler. Rain is abundant throughout the year; snow is entirely unknown; storms, with accompanying high winds and very severe thunder and lightning, occur frequently.

Flora and Fauna.— Eastern Paraguay is covered with virgin forests of great lianas, pindo and enbocaya palms, orange and banana trees, timbo brush, interspersed with great grasses and flowering plants. West of the Paraguay lies the Chaco region, covered largely with marshes, heaths and yatai palms. Quebracho forests occupy the higher regions. The jaguar is the most formidable denizen of the wild, but there are also the puma, tiger cat, marten, tapir, polecat, peccary and deer. There are large alligators and many venomous snakes. Boas reach a great size, but are very inoffensive. Paraguay is famed for its birds. Flies and gnats are veritable pests in the wild regions, but apparently disappear with the clearing and cultivation of the land.

Religion and Education.— Article III (Pt. I, Chap. I) of the constitution provides: "The religion of the state is the Roman Catholic Apostolic; Congress, however, shall not have the power to forbid the exercise of any other religion within the territory of the republic. The chief prelate of the Paraguayan church shall be a Paraguayan.” Article VIII declares: “Primary instruction is compulsory,” directing Congress to “promote by all possible means the instruction of the citizens.” Professors at the national college are appointed by the President of the republic, though nominated by the council of that institution. The entire educational system was, from 1609 to 1767, entrusted to the Jesuits; the tendency to nationalize it has grown strong principally during the last 40 years. In all schools the Spanish language is taught, and the Guaraní, though still the tongue of the common people everywhere outside of the larger towns, is gradually being displaced; it is even prohibited within the college precincts. The educational system adopted by the government provides for rural schools, with three grades; elementary schools, with four grades; and more complete schools with six grades (consult Report of the Commissioner of Education for the year ended 30 June 1915, Washington 1915). An agricultural school is being established at Ypacarai, with two instructors, who have been educated abroad, in charge of courses of study. The system of employing teachers for special subjects, which prevails in secondary schools throughout South America, is applied to a certain extent in Paraguay's elementary schools.

Industry and Commerce.— *Forest and Agriculture.* Woods which are valuable on account of their extraordinary durability and powers of resistance are characteristic forest products; many of these being so heavy that they sink when thrown into the water. Dyewoods of many varieties, medicinal and resinous trees, wild vanilla, etc., are found. The chief and most distinctive product of the country is yerba, the “Paraguayan tea,” also called yerba maté; sugar cane, cotton, tobacco, mandioca, rice, maize, coffee, textile plants (caraguatá, ibira, etc.), oranges, bananas and grapes are successfully culitvated. A memorandum submitted by the delegation of Paraguay to the First Pan-American Financial Conference, held at Washington in 1915, contains the statements that the “artificial cultivation” of yerba maté, tried until recently without good results, has finally been successful, and now extended plantations of it may be seen; that the cultivation of tobacco is being perfected, thanks to the efforts of the Banco Agrícola; that the yield of cotton of fine quality, with long, silky and strong fibre “is proportionately superior to that of any other cotton-raising country”; that sugar cane, rice and Indian corn are cultivated with easily-won success; and that the list of agricultural products, some of them unknown elsewhere, includes mamón, mandioca, tártago (from which castor oil is locally extracted), coffee, wheat, olives, coco, ramie, barley, vanilla, cinnamon, etc. Forests cover about one-half of the total area, and these contain “an incalculable wealth in woods for construction and for cabinetmaking,” of which the following are of demonstrated utility: curupay and lapacho, both very durable; incienso, a strong and flexible wood; ibiraró, considered a good substitute for teakwood; cedar and petereby, the latter as well as the former suitable for cabinetmaking; timbó and ibyrapytá, both very abundant, and the latter useful as a material for paving-blocks; laurel, used for railway ties; guayaybí with qualities similar to those of hickory; palo santo, “suitable for axle bearings, in place of metal”; quebracho the axe-breaker, etymologically, and well-known industrially as a source of tannin and as resistant material for railway ties. Among the numerous resources on which the country depends, cattle raising is mentioned as one of the most profitable, pasture-land being abundant, well watered and provided with natural shelter for the animals.

The tobacco industry reached the maximum figures in 1916, the entries in the market amounting to 77,804 bales in the first 11 months of the year, or 13,830 bales more than in the previous year. Only 61,000 bales were exported in the 1916 period, as low water in the river temporarily obstructed exportation. The normal tobacco crop is about 22,500,000 pounds. The livestock industry, which is counted as the chief source of wealth in Paraguay, has been developing recently and is receiving a new impulse under the prospect of the establishment of a packing house by manufacturers from the United States. The exports of live animals to Argentina have not varied greatly in the last four years, the figures being as follows: 1913, 39,564 head; 1914, 24,385; 1915, 29,509; 1916, 29,940. The yerba crop of 1916 amounted to 7,206,227 pounds. Quebracho exports in 1916 reached 21,136 tons. Sugar is produced to the amount of 1,600 tons annually. A census taken of the livestock in Paraguay in 1915 gave the following figures: Horned cattle, 5,249,043; sheep, 600,000; horses, 478,000; mules, 17,000; asses, 18,000; hogs, 61,000 and goats 87,000. Among the cattle countries of South America that have cattle for export, Paraguay is said to occupy second place with 11.8 head per square kilometer and 5,249 beeves for each 1,000 inhabitants of the country.

Some Characteristic Industrial Products. — The very moderate activity we have observed in the industrial life of Paraguay is directed chiefly to forest industries, such as the production of tannin at Puerto Casado, Puerto Sastre, Puerto Max, Puerto María, Puerto Galileo, and other places. The preparation of woods for exportation is carried on at the Nogués and Pinasco plants, at Puerto Médanos and many other points that are connected with ports of shipment by private railways. Exploitation of Paraguayan tea (yerba maté) is to a large extent controlled by the organization known as The Industrial Paraguaya.

In the making of the very beautiful ñanduti lace, Paraguayan art and industry unite, contributing equally to a charming product — the artistic tradition being an inheritance from the early days of the Spanish occupation, while the exemplary patient labor in the execution of traditional lace designs is, of course, a characteristic expression of that limited art-impulse of the aborigines which is associated with patient workmanship. Excellent hammocks are made by the same painstaking folk. As meritorious products we mention also the native cigars, the great variety of preserved fruits (native fruits in native cane sugar), and the extract from the leaves of a native orange tree which is known commercially as petitgrain or oil of petitgrain, of which 101,717 pounds were exported in 1916.

Imports and Exports.— The values of foreign commerce for the year 1915 were, for imports $2,340,510 and for exports $5,409,858; a total of $7,750,368 only; for 1916, imports $4,651,525 and exports $4,807,460, a total of $9,458,985, whereas in 1913 the total was $13,539,744 gold and $9,441,807 even in 1914, when the effects of the European War were first apparent. Before the war an increase was noted from year to year, and the chief sources of imports were then in Germany, England, Argentina, France, Spain and Italy; the articles imported being textiles, foodstuffs, hardware, fancy goods, wines, spirits, drugs and chemicals, ready-made clothing, chinaware and crockery, hats, rugs and carpets, shoes, jewelry and railway or tramway materials. The principal exports are livestock, wool, dried beef, oranges, tobacco, cocoanut bran, essence of petitgrain, extract of quebracho, yerba maté, palms and many kinds of wood. Commercial interchange with the United States during the years 1910–17 was on a footing of small values for exports from Paraguay — only about one-third as much as the total of Paraguay's imports from the United States during that period. In 1914 Paraguay's exports to the United States were valued at $10,668, and her imports from the United States at $413,937; but in 1915 the figures were: Paraguay's exports to the United States valued at $292,410 and imports from the United States, $209,148. Imports from the United States in 1916 amounted to $570,000, and exports to $228,000. Paraguay's total imports in 1916 were $4,530,000, and exports $4,710,000.

Political Divisions, Cities and Population. — The Republic of Paraguay is divided into 20 electoral districts, which in turn are subdivided into 93 departments. The districts are numbered I to XX. Their populations, capitals and populations of the latter are as follows:

DISTRICTS	Population	Capital	Population
I	34,580	Villa Concepción	12,600
II	37,429	San Pedro	8,926
III	36,195	Altos	8,715
IV	30,262	Barrero Grande	9,143
V	31,182	San José	9,120
VI	19,274	Ajos	6,283
VII	32,297	Villa Rica	26,000
VIII	25,886	Hiaty	7,096
IX	28,531	Caazapá	16,341
X	28,418	Yutí	10,953
XI	22,978	Villa Encarnación	12,496
XII	30,365	San Ignacio	5,121
XIII	22,535	Ibicuí	10,253
XIV	30,454	Quindy	11,943
XV	38,822	Paraguarí	10,328
XVI	28,608	Itauguá	8,820
XVII	37,435	Luque	16,501
XVIII	38,633	Itá	12,329
XIX	16,563	Villa Oliva	3,504
XX	37,193	Villa del Pilar	6,697

	Area, square miles	Population
Total	65,000	607,640
Chaco Territory*	100,000	25,000 100,000 uncivilized Indians
Grand total	165,000	732,640

* In dispute with Bolivia.

Army and Navy.— The Paraguayan army is drilled, trained and armed on the German model. It comprises about 100 officers and 2,500 men, distributed in five centres. The Mauser is the infantry arm. A two-year compulsory service law has been in operation since 1914, but it appears to be enforced only in the case of refractory elements of the population. The navy is composed of a number of converted merchant vessels armed with modern guns. The largest is about 600 tons gross register.

Banking and Finance.— The Banco de la República (authorized capital $20,000,000 gold, $6,000,000 already subscribed) and the Banco Mercantil del Paraguay (authorized capital, in terms of the depreciated currency described under *Monetary System*, 25,000,000 paper pesos and 20,000,000 paid in, both have headquarters in Asunción. The Banco de España y América, with main offices in Buenos Aires, has a branch in Asunción (capital $2,200,000 gold). Some of the smaller cities have agencies of the foregoing. The normal banking rate is 12 per cent annually. The Banco Agricola (capital originally 15,000,000 pesos legal money and recently increased to 30,000,000 currency pesos) has official standing as an institution authorized to assist farmers and manufacturers with loans at a reduced rate of interest and also to supply advice and instruction in regard to methods of cultivation.

The internal debt, as stated in the *Financial Congress*, was $559,675 gold and 11,564,572 currency pesos; to which amount $394,119 gold and 33,913,373 currency pesos are to be added as the aggregate of individual claims for damages sustained «during past epochs of revolution.» The balance of the treasury's debt to the Banco de la República, of $615,995.43, was adjusted by grant of a privilege connected with a certain tax imposed on exports. The recent issue of 60,000,000 pesos, paper, has nearly doubled the amount outstanding, which is now 125,000,000 pesos equivalent to 8,333,000 gold pesos, approximately. In 1919 the amount of the foreign debt, arising from the loans of 1871 and 1872 made in London, was $3,679,705. The government's chief sources of income are customs duties on imports and exports, land and postal taxes, internal consumption revenues, etc.

Monetary System.— The nominal unit of Paraguay's monetary system is the gold peso of Argentina weighing 1.6129 grammes of gold .900 fine, or say 1.4516 grammes of fine gold (par value $0.96475, currency of the United States), but in actual circulation we find only inconvertible notes of almost incredibly slight purchasing power. Large amounts may be «reduced to gold» theoretically at the rate of 1.500 per cent, according to an authoritative statement in the *Pan American Financial Conference Proceedings*, 1915. The fact that practically no gold or silver coins circulate in Paraguay, the currency being limited to the depreciated paper, is mentioned in *Latin American Monetary Systems and Exchange Conditions*, by Joseph T. Cosby (New York 1915). Mr. Cosby adds: «No provision is made for the redemption of the outstanding notes, with the exception of a small volume of notes known as Moneda Nacional»— this national money being guaranteed by a gold reserve of one-tenth of the issue, and having a stable value on that basis. When fractions of the paper peso in the form of nickel coin were placed in circulation, the paper currency depreciated so rapidly that the intrinsic value of the nickel coins soon exceeded their monetary value. Therefore, those coins, tending to disappear from circulation, occasionally are sold as curiosities. Only in foreign remittances do we note the employment of exchange payable in gold and commanding a high premium.

Waterways, Railroads, Post Offices, etc.— River steamboats maintain communication between the capital and the city of Buenos Aires, and a railway, with train ferry across the Alto Paraná from Posadas to Villa Encarnación, also connects the same cities. The upper reaches of the Paraguay River above Asunción and, to a limited extent, the lower Alto Paraná are navigable — in many places precariously; even below Asunción, indeed, the channels shift suddenly and are hard to find. Travel and transportation between Paraguay and the great world outside are thus difficult, inadequate and controlled by a single foreign state; naturally, therefore, the landlocked country is seeking now by pacific arrangement, as it sought in the last century by force of arms (see *History*), its exits and its entrances — among which there is to be mentioned the projected line of railway from Asunción to Paraná, near the magnificent falls of Yguazú, and thence by a Brazilian line to the Atlantic Ocean. The baffled yet admirably hopeful country has 400 post offices and 2,000 miles of telegraph lines, with stations at all the chief towns from Asunción southward. There are wireless telegraph stations at Asunción, Encarnación and Concepción.

Government.—The constitution of 1870, now in force, vests the powers of the government in three co-ordinate branches, the legislative, executive and judicial. The National Congress, consisting of Senate and Chamber of Deputies, meets each year at Asunción. Senators, elected by the people, by universal suffrage, one senator for each 12,000 inhabitants, serve for six years. Deputies, similarly chosen, but in the proportion of one for each 6,000, serve four years. "The executive power," says the constitution, "shall be vested in a citizen, to be called President of the Republic of Paraguay. In case of sickness, absence from the capital, death, resignation or dismissal of the President, the executive power shall be exercised by the Vice-President." Both President and Vice-President are chosen by an electoral college, serve for four years and "cannot be re-elected except after the lapse of two presidential terms." The electoral law of 30 Nov. 1916 provides for 20 senators and 40 deputies. The senators and deputies receive each $3,000 per month. Numerous provisions of the constitution are designed to guard against the revival of dictatorships, or undue extension of the powers of the executive (see section *History*). In regard to the cabinet, article 104 provides: "Five ministers or secretaries, respectively called of the Interior; Foreign Relations; the Treasury; Justice, Worship and Public Instruction; and War and the Navy, shall attend to the business of the nation, and legalize with their signatures the acts of the President. Those acts without their signatures shall have no efficacy." To the foregoing, the Ministerio de Fomento (department of promotion) has been added, making the number of cabinet members at present (1919) six instead of five. These ministers are responsible to Congress. The judicial power is vested in a Supreme Court, consisting of three justices and having "the right to inspect and supervise the action of all inferior courts"— that is, in practice, the courts of appeal, and criminal, police, first instance, and justices' courts.

An interesting side-light is thrown upon the constitutional provisions designed to curtail the chief executive's authority when we recall the circumstances that prior to the war with the Triple Alliance Paraguay had no debt, either domestic or foreign. Her first foreign loans were negotiated in 1871–72 at London; and on 31 Dec. 1901 the debt thus contracted amounted to $4,787,077.86. On the same day, the Brazilian and Argentine indemnities, results of the war, amounted to $9,876,466 and $9,563,990 respectively.

History.—Sebastian Cabot, in 1527, explored the Paraná, and sailed up the Paraguay to the mouth of the Bermejo in the following year. Hoping that a passage to the land of gold and silver mines, Upper Peru or Bolivia, would be found in some part of this great river-system (a hope which still leads explorers along the courses of the Pilcomayo and Bermejo), 300 Spanish adventurers, in 1536, proceeded up the Paraguay to the site of the present city of Asunción, where they built a fort. This outpost became a centre of military enterprise, and, after 1609, of missionary work among the natives. The Spanish province of Paraguay embraced the whole region south of the Portuguese possessions in Brazil and east of the Andes until 1617; but when Buenos Aires was made a provincial capital the jurisdiction of the governors, afterward viceroys, at that city extended over the settlements on the Paraguay and its tributaries, as well as those on the Paraná and La Plata. The Argentine general, Belgrano, incited the Paraguayans to revolt against Spain in 1810. On 14 May 1811 Pedro Juan Caballero with a few companions took possession of the Spanish barracks, and the next day compelled Governor Velasco to divide his authority with two leaders of the revolution. An assembly which began its sessions on 11 June 1811 renounced allegiance to Spain, and this declaration was ratified by the Congress which assembled for the first time on 1 Oct. 1813, and on the 12th vested the executive branch of the government in two consuls, Dr. José Gaspar Rodriguez de Francia and Fulgencio Yegros. Dr. Francia became dictator (1813–40). After his death the Paraguayans experimented with a government of four military officers, which was superseded by a triumvirate on 23 Jan. 1841; the triumvirate in turn was replaced by two consuls on 12 March, and next, from 1844 to 1870, the whole power of the state was grasped by Carlos Antonio Lopez and his son and successor Francisco Solano Lopez. The younger Lopez made deliberate preparations for a war of conquest. When the time was ripe for action, he issued, through Congress, a declaration of war against Argentina, 18 March 1865. Argentina, Brazil and Uruguay formed an alliance to oppose him. Paraguay was defeated and almost depopulated in a struggle which ended with the death of Lopez, 1 March 1870. A comparison of the official census of 1857 with that of 1873 shows, allowance being made for increase at the normal rate between 1857 and 1865, that

Paraguay lost more than 1,200,000 inhabitants during the war — her entire population, except 28,746 men and 202,333 women and children. It is proper to assume exaggeration in the earlier census, while the later one was undoubtedly defective; but, even so, the disaster must be regarded as the severest that any small nation in recent times has sustained, rising from such a trial still resourceful and independent. To Brazil, Paraguay ceded the territory on the north and northeast; to Argentina, by the treaty of 3 Feb. 1876, the district south of the Pilcomayo. But a distinguished arbitrator, the President of the United States, 12 Nov. 1878, awarded to Paraguay a district north of the Pilcomayo, which Argentina claimed. During the last decade the resort to arms for the decision of political disputes has not been discontinued; and if we review the entire period since 1870 (see section *Government*) we realize the force of the statement that «only three presidents (under the Constitution then adopted) have been allowed by revolutionists to complete the term of office.» Recent disturbances of the public order were those of 2 to 4 July 1908, which led to President Ferreira's resignation; of 1910 and 1911, when Manuel Gondra and Albino Jara were compelled to resign; of 22 March 1912, in view of which President Pena and his Cabinet took refuge on foreign warships; of 27 April to 13 May the same year, when the revolutionary efforts came short of success, and within a week Eduardo Schaerer was elected to the presidency for the four-year term beginning 15 Aug. 1912; of January 1915 (the Escobar revolt) when another revolutionary failure was recorded and martial law was declared. On 19 July 1915 a treaty was signed with Bolivia, the aim of both countries being to secure, if possible, a just and amicable settlement of difficult questions relating to the boundary dispute and conflicting titles to the Chaco.

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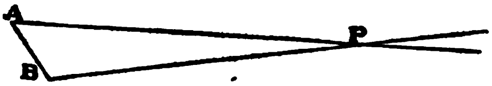
MARRION WILCOX.

PARAGUAY RIVER, South America, the largest affluent of the Paraná River (q.v.), with its source in the plateau of the Matto Grosso, Brazil, about lat. 14° 24′ S., near the town of Diamantino. It flows southward through Brazil, forming for some distance the boundary with Bolivia, and enters Paraguay at Confluencia, where the three states meet, then continues the remainder of its course southward through the republic to which it gives its name. At Tres Bocas on the Argentina frontier the Paraguay flows into the Paraná. Its total length is about 1,300 miles.

PARAGUAY TEA. See MATÉ.

PARALLAX, a term used in astronomy to designate the displacement in the apparent direction of a heavenly body caused by a change in the position of the observer. Let A and B be two points from which the body P is conceived to be viewed. An observer at A will see the body as if on the celestial sphere in the direction A P. An observer at B would see it in the direction B P. It is evident that the difference of these directions is equal to the angle at P between the lines A P and B P. It follows that if the length of the line A B, and its direction, are accurately known, and if the observers can determine simultaneously the exact direction in which the body, P, lies, the angle P of the triangle will also be known. Then the distance A P or B P of the body from either of the observers can be computed by trigonometric methods. The following are the principal applications of Parallax in astronomy: The distance and direction of a planet or other heavenly body, has to be calculated by the astronomer, in the first place, as if they were measured from the centre of the earth. But the observer is necessarily on the earth's surface. Parallax is then the difference between the direction from the centre and that from any station which the observer may chance to occupy. The right ascension, declination and distance of the body will all be different according as it is measured from the earth's centre, or from the eye of the observer. We thus have Parallax in R. A. and in Dec., which is mostly used in the case of the moon and planets.



The only method of determining by direct measurement the distances of the bodies of the solar system is through observations of their parallax. It is evident that the nearer the body, the greater will be its parallax. Hence, in order to measure a distance in this way, it is necessary to choose the times when the body is nearest to the earth. The moon, being much the nearest of all the heavenly bodies, has the largest parallax of all. Its average value is a little less than 1° (about 57′ 2″); but, when nearest the earth, it exceeds 1°. Being so large, even the ancient astronomers were able to measure it and thus determine approximately the distance of our satellite. Measures of the moon's parallax in modern times have been made by comparing its altitude, or declination, as it passes the meridian, at different observatories in the two hemispheres. The Greenwich Observatory and that of the Cape of Good Hope have used their observations for this purpose.

Determinations of parallax can be made

without the observer changing his position on the earth's surface, because as the earth rotates on its axis the observer is carried around with it. He thus sees the moon or a planet in different directions, according to the different points of its apparent diurnal course. The general effect of parallax, as we can readily see, is to make the moon or a planet appear somewhat nearer the horizon than it really is. If a body is rising in the east, the change thus produced in its apparent direction from the observer increases its right ascension. In the west the same effect diminishes the right ascension. Thus, by making observations of the moon or a planet in the east and in the west alternately, its parallax, and therefore its distance, can be determined. This change is called the *diurnal parallax*. The diurnal parallax of Mars has thus been determined by various observers. If the position of the sun on the celestial sphere could be determined with the utmost precision, its distance could be measured by its diurnal parallax. But as this luminary cannot be seen at the same time with the stars in its immediate neighborhood, it is not possible to make any very exact determination of the sun's parallax by direct observation. What is done instead of this is to measure the parallax of various planets, using the principles explained in theoretical astronomy. (See ASTRONOMY, THEORETICAL). In recent times those asteroids which came nearest to the earth have been mostly used for this purpose; in particular, the discovery in 1898 of an asteroid moving in so remarkable an orbit that it periodically approaches nearer the earth than any other heavenly body except the moon will lead to a value of the solar parallax far more accurate than can be determined by any other method. See ASTEROID.

Annual Parallax is that due to the motion of the earth in its orbit. It is applied only to the fixed stars. By the parallax of a fixed star is meant the difference in its direction, as seen from the sun, and from either extremity of the earth's orbit. It is, therefore, equal to the angle subtended by the radius of the earth's orbit when seen from the star.

The determination of annual parallax is far more difficult than that of diurnal parallax since, on account of the great distances of the stars, their yearly parallactic displacements are, in the great majority of cases, wholly beyond our powers of detection by any instrumental means which we possess. It was not until 1838 that the processes of practical astronomy had become sufficiently refined to permit the direct measurement of the parallax of any star. In this year Bessel determined the distance of the small, 5.6 magnitude, star 61 Cygni; the annual parallax of this is but 0.41 which corresponds to a distance of eight light years. The nearest of all the stars so far discovered is a brilliant double star of the southern heavens known as Alpha Centauri; the annual parallax of this is 0.76, which corresponds to a distance of 4.3 light years. All earlier determinations of parallax were made by direct measurement at the telescope; very recently, however, an extraordinary increase in accuracy has been attained by the employment of photographic methods and this work is being so vigorously prosecuted at many of the larger observatories that our knowledge of the absolute distance of the nearer stars is each year becoming rapidly extended. See ASTROPHOTOGRAPHY.

SIMON NEWCOMB.

PARALLELISM, a parallel or comparison used in any sense of the word parallel. By Spinoza the term is used to suggest that every material object has corresponding to it an ideal counterpart. In psychology the word is used of the connection between matter and mind, notably between brain processes and mental processes.

In literature parallelism is a double statement of the same notion, either by simple variation of the idea or by negation in the second member of the opposite of the statement in the first.

PARALLELISM, *in biology*, is another name for what is more commonly termed *convergence*, expressing a phase of organic evolution. It appears in accordance with a law that similar methods and necessities of physical growth in reaction to the environment will produce likeness of bodily form and adaptations in animals of different stocks, as, for example, marine mammals and fishes, birds and insects, or between animals of the same order; and in the last-named case (most frequently observed among insects) it is often disputable whether many of the instances are to be attributed to parallelism or to mimicry (q.v.). The similarity noted above is most manifest in the field of locomotion where virtually the same mechanical problems must be met by very different kinds of animals, as, for example, in overcoming the resistance and tenuity of the water by fishes, and of the air by flying birds and bats. Here the objects to be gained by process of adaptation of a vertebrate type of structure to the same purposes, and in similar media, are buoyancy, progression and agility, and the continued effort to attain them have produced in creatures very unlike one another otherwise similarity in outline of body, and in instruments of propulsion (wings or fins and tail), which in some cases is very striking. Such parallelism in adaptation results from the fact that, as Osborn states it ('Origin of Life,' 1917), «the production of externally similar forms in adaptation to similar external natural forces,» is one of the laws or modes of organic evolution.

PARALLELOGRAM, *in mathematics*, a quadrilateral rectilineal figure which has its opposite sides parallel. See GEOMETRY.

PARALLELOGRAM OF FORCES. See MECHANICS.

PARALLELS. See GEOMETRY.

PARALLELS OF LATITUDE. See LATITUDE.

PARALYSIS, a loss of muscular power, whereby contractility is either abolished or greatly diminished. Loss of sensation, general or special, was formerly spoken of as sensory paralysis, to distinguish it from a loss of muscular motion, or motor paralysis. At the present time the term paralysis is usually limited to denoting motor paralysis, and defects in sensation are considered under the head of disorders of sensation.

Palsy is a term rarely used by physicians, but popularly it is a synonym for paralysis. Paresis is a partial or incomplete motor paralysis, but the term is seldom used by physicians except as referring to a disease of the insane, known also as general paresis (q.v.) or paretic dementia, in which gradually increasing motor paralysis and disorders of sensation are prominent.

Paralysis may affect either the voluntary or the involuntary muscles. It may be limited to one muscle or group of muscles, constituting a local paralysis, or it may involve those of various parts of the body, or nearly all the voluntary muscles, and is sometimes associated with sensory disturbances, such as impairment of common sensation, or alterations in the temperature of the skin. Paralysis is not a disease, but the result of some mechanical obstruction, of some functional disorder or structural damage in the nervous system (to nerves, nerve-centres, nerve-cells or other constituents), or of degenerative atrophy of the affected muscles. As a consequence of the conditions named, either the proper transmission of motor nervous impulses is prevented, or the debilitated muscles are not capable of contracting, though the impulses may be normally transmitted.

If paralysis is long continued, degenerative changes occur in muscular and nerve fibres, resulting in wasting of the parts supplied by the nerves affected, and consequent permanent inability of these parts to perform their functions. Some of the causes of paralysis are pressure of a tumor, or of a broken bone, as of the skull or a vertebra; an exudation of blood (due to diseased arteries, external injuries, etc.); an embolus disintegration of nervous tissue by softening or thickening; an accumulation of serum, or other results of inflammation. It may occur without any discoverable lesion, as in hysteric or emotional paralysis, in alcoholic paralysis, in decubitous paralysis, due to pressure on a nerve from lying for a long time in one position, and in temporary paralysis due to drugs or hypnotic or hysteric conditions.

The forms of paralysis are numerous. The names assigned to them usually refer to the situation in the neuromuscular apparatus of the damage, lesion or defective activity producing the paralyses; to the condition of the muscles affected; or to the extrinsic causes of certain paralyses or the discoverers of those causes. The forms of paralysis include: Acute ascending (Landry's paralysis), often fatal, beginning in the muscles of the feet and ascending to the other muscles of the body — cause not known; birth, due to injuries at birth; bulbar, due to changes in motor centres of the medulla oblongata; Bell's, a facial paralysis (see BELL'S PALSY); central, due to a lesion of the brain or spinal cord; cerebral, due to an intercranial lesion; crossed, paralysis of one side of the face and the other side of the body; crural, chiefly affecting the thigh or thighs; diphtheritic (also post-diphtheritic), a partial paralysis chiefly of the muscles of the soft palate and throat, often following diphtheria; Cruveilhier's or progressive muscular atrophy; divers', or caisson disease (q.v.); galloping, a rapidly progressive form of general paresis; Indian-bow, paralysis of the thyro-arytenoid muscles; infantile, or poliomyelitis anterior; ischemic, a local paralysis due to a stoppage of the circulation by an embolus, a thrombus, etc.; lead, due to lead-poisoning; multiple, a complication of local paralyses; neural, originating in the nerves; and spastic, a variety marked by rigidity of muscles and heightened tendon-reflexes.

Paralysis is further distinguished with reference to its course, as syphilitic, traumatic, toxic, etc., according to the nerve, muscles or part specially affected; as, obturator, ulnar, brachial, dental, etc. A paralysis may be reflex, due to peripheral irritation. Monoplegia is a paralysis of a single part of the body; diplegia, a bilateral paralysis, affects like parts on either side of the body.

The two most extensive forms of paralysis are hemiplegia (q.v.), paralysis of one side of the body, and paraplegia, paralysis of the legs and lower part of the body. In both forms there may be a loss of sensation as well as of motion. Although hemiplegia is usually the result of a cerebral hemorrhage or embolism, it may result from lesions of the spinal cord, or as a hysteric complication. Paraplegia is due to some lesion in the spinal cord.

The treatment of paralysis must depend very largely upon the cause, and should be in the hands of a physician, although the patient can assist materially by faithful attention to hygienic measures, and by exerting the will-power upon more delinquent muscles. Passive movements of the muscles by various forms of massage and the use of electricity are of value, but must be carefully employed, or they may do harm. Acute ascending paralysis as described by Landry in 1859 is characterized by a weakness beginning in the legs, proceeding to complete paralysis, extending usually within a few days to the body muscles and to the arms and terminating fatally in the majority of instances by involvement of the respiratory muscles. It is regarded as a symptom — complex rather than a disease. It is always dangerous, death occurring even after several weeks. Treatment is not very promising unless some definite etiological factor can be made out. Thus salvarsan appears to have caused a recovery in one case in which there had been a previous syphilitic infection.

Paralysis agitans is essentially a disease of advancing years, rarely occurring before 40 and mostly after 50. Heredity plays but a small part in the etiology of the disease for which it is usually impossible to assign a direct cause. Worry, grief, fright, overwork, hardship, exposure or acute disease appear to be the exciting causes. Its characteristic feature is the tremor, which is usually also the first symptom of the disease. The speech is often altered in the disease, the true nature of which is still unknown. It is of slow progress and may be of many years' duration, death being usually due to an intercurrent disease. Avoidance of excitement is important, warm baths afford some relief and a combination of active and passive movements has been found very beneficial in many cases. Care must be taken not to fatigue the patient. The drugs most commonly administered are the mydriatics, belladonna, atropine, hyoscyamine, hyoscine and duboisine sulphate. Care must be used in their administration as they are poisonous in large doses.

Diphtheritic paralysis is a sequel of diphtheria involving the paralysis of certain muscles. It is treated as multiple neuritis. After the acute stage has passed, fats, tonics, especially strychnine and cod-liver oil, a course of galvanism and massage of the affected muscles are resorted to with success in nearly all cases.

PARAMARIBO, pār-ą-măr'ĭbō, Dutch Guiana, South America, the capital of the colony, on the west bank of the estuary of the Surinam River, 10 miles above its outlet on the Atlantic Ocean. It is a well-laid-out town, with substantial buildings and an excellent harbor defended by two forts. The whole trade of Dutch Guiana centres in Paramaribo. Pop. about 37,035.

PARAMATTA. See PARRAMATTA, NEW SOUTH WALES.

PARAMECIUM, or **SLIPPER ANIMALCULE,** an oval, flat infusorian very common in pond water or in vegetable infusion. Each paramecium is covered with rows of cilia which lash it through the water and drive food-particles into an aperture which serves as mouth. As the food-particles enter they take bubbles of water with them, and are moved round and round in the living substance until they are digested or got rid of. There are two (excretory) contractile vacuoles; the large nucleus has a small one (paranucleus) lying beside it; beneath the thin rind there are remarkable eversible threads. A paramecium often divides transversely into two; these two repeat the process and with continually diminishing size rapid multiplication may thus proceed for a while. It has its limits, however, and then two individual infusorians conjugate, exchange some of the material of their paranuclei, and separate. Thus they seem to renew their youth. See INFUSORIA.

PARAMETER, *in mathematics,* a term applied to a constant quantity entering the equation of a curve. The term is principally used in discussing the conic sections.

PARANÁ, pä-rä-nä', state of the Brazilian Confederation, bounded on the north by São Paolo, on the east by the same state and by the Atlantic, on the south by Santa Catharina and the northeastern tip of Argentina and on the west by Paraguay and Matto Grosso. The main northern and western boundary is the Paraná (and the Paranapanema); and the Iguassú forms the greater part of the southern boundary. The Ivahy and Piquiry flow northwest into the Paraná; but, like the Iguassú, they are filled with rapids and unfit for navigation. The short coastline has the excellent harbor of Paranagua; and the coast is picturesque, but hot, humid and fatal with its yellow fever. In the forest-covered interior, which is only partially explored, the climate is more equable and much cooler; the temperature averages about 17° C., with a winter mean of 14° and a summer mean of 18°; and the rains are abundant. Manioc, Indian corn, coffee and cotton grow on the coast, and the cereals and fruits of the northern and central United States in the interior. There are valuable (but unexplored) supplies of iron, mercury and gold, and there are coal deposits. There are valuable pine forests, and the state is a great source of the supply of matté. The port of Paranagua is connected by a railroad with the capital city of the state, Curitaba (pop. 50,000). The area is 85,451 square miles and the population, largely increased by German and Polish immigration, is nearly 406,000.

PARANÁ, or **BAJADA** (bă-hă-dă') **DEL PARANA,** Argentina, capital of Entre Rios province, on the left bank of the Paraná, the terminus of a branch railroad from Concepción. It is connected by daily steamer with Santa Fé on the west bank of the Paraná. It is well laid out, with straight unpaved streets, telephone and street car service and other modern improvements. The city was founded in 1730; was the federal capital 1852–61; is the location of the provincial university, and has steamship connections with Buenos Aires; ships of 6,000 tons come up the Paraná as far as this. But the city is not so prosperous as it was 50 years ago. Pop. 65,000.

PARANÁ, the second largest river of South America, with a length and discharge greater than those of the Mississippi and a drainage area nearly as large. Its annual flow is three times that of the Saint Lawrence and five times that of the Nile. It is the principal tributary of the great estuary called the Rio de la Plata, which it forms by its juncture with the Uruguay. The Paraná itself is formed by the confluence of the Paranahyba, which is sometimes considered its upper course as being the axial stream, and the Rio Grande, the true upper course. The latter rises only 60 miles from the coast on the west slope of the Sierra de Mantiqueira, near Itatiaya; flows east across Minas Geraes; separates that state from São Paolo, and receives the Sapucahy and the Mosy-Guassu before its juncture with the Paranahyba (q.v.) at the meeting-point of Matto Grosso, Minas Geraes and São Paolo. The Rio Grande itself is sometimes called the Pará or Paraná, but the latter name is more properly used of the double stream, which flows southeast across the Brazilian plateau with several splendid cataracts and many great rapids, the most notable being at Salto Guaira, the beginning of the river's middle course, in which it is the boundary between Brazil and Paraguay, and then between Paraguay and Argentina. It joins the Paraguay river (q.v.) just above Corrientes, which takes its name from this juncture, and then flows a little west of south through Argentina, turning to the east at Rosario, and a few miles above Buenos Aires joining the Uruguay. In general the upper course of the Paraná is navigable save at the falls of Urupupunga and Guaira and at the rapids extending 150 miles below Guaira; most of its minor tributaries join with cataracts, that of the Iguassú, which, apart from the Uruguay, is nearly the only confluent from the left, being the most majestic. Through the Argentinian plain the river is broad and easily navigable; near the embouchure there is a constantly shifting delta, the main difficulty of navigation. Ships of 10,000 tons drawing 23 feet of water easily make their way 400 miles from the ocean to Rosario. Steamers drawing 13 feet ply from Corrientes to Asunción, on the Paraguay River, at any season, and at high water to the juncture of the Iguassú. The depth of the river varies greatly with rains and melting snows, and the volume is much greater at Corrientes than below. The Paraná is 2,720 miles long from its source to the Plata. Consult Hutchinson, ‘The Paraná’ (1868).

PARANAQUA, pä-rä-nä-gwä, Brazil, port of the state of Paraná (q.v.), southeast of Curitiba, the capital, and on the southern side of the Gulf of Paranagua, which is navigable for vessels of 300 to 400 tons and is separated from the Atlantic by the Ilha do Mel. Railroads built by French enterprise connect the city with Curitiba and with the harbor at Antonina; and there is regular steamboat connection with Hamburg, because of the German colonists in the state and the valuable exports of maté, hardwoods, cereals and sugar. Pop. 6,000.

PARANAHYBA, pä-rä-nä-ē'ba, or **PARNAHYBA**, pär-nä-ē'bä, Brazil, (1) a city and seaport of the state of Piauhy, on the river of the same name, about 10 miles from the coast and 50 miles north of Pernambuco, with which and Natal it has rail connections. It is an unhealthy town, but of importance as the seaport for the region. Cotton and sugar are the principal exports. Pop. (estimated) 20,000. (2) A river of northeastern Brazil, rising between the Serra das Mangabeiras and the Serra Gurgueia, and forming the boundry between Maranhão and Piauhy. It is more than 630 miles long, has no rapids in its course to the northeast and is navigable for 400 miles. It empties into the Atlantic through six mouths, forming a large delta, to the east of which is the citv of Paranahyba (q.v.). The affluents of the river are the Gurgueia, Piauhy, Poty and Longa from the right and the Balsas on the left. (3) An affluent of the Paraná (q.v.), rising on the boundary of the states of Goyaz and Minas Geraes in the Serra dos Vertientes. It forms the line between the two states mentioned, receives at the left the Velhas and the Tepico rivers and on the right the Corumba and the Meia Ponte, and joins the Rio Grande de Paraná (or Paraná), with which it forms the upper waters of the Paraná (q.v.). The Paranahyba occupies the axis of the Paraná basin, but cannot be reckoned the true headwater of the Paraná because of its short course and small volume of water as compared with the Rio Grande. Above its juncture it forms several cascades and rapids. It measures altogether more than 520 miles.

PARANOIA, one of the types of the psychoses. It is characterized by a marked hereditary predisposition, a slow development of persecutory ideas, almost from childhood, with increasing inability to get on in the world, and it usually terminates in a mild type of mental disintegration. Its subjects are the people with pronounced mental twists, sometimes antisocial, more often able to get along in society if they are able to be let alone. The disease is one of great importance, and yet the conduct of those affected is often so closely allied to the average conduct of the environment that it becomes extremely difficult to come to the decision of mental irresponsibility in many of these cases. Although a rare disease, it is particularly important to recognize it, since paranoiacs are often very dangerous lunatics. The murderer of Garfield was an example. A typical case usually starts wrong in the world, with a mental instability inherited from intensely neuropathic parents. Some type of mental disease or extremism or pronounced crankiness or violent temper is present in the crankiness of most of these cases. Throughout the developing period these children are usually different from other children; their intellects may be as bright as others; very often they are precocious, but irregularly so, being generally below par; they are apt to be less gay, less expansive; are characteristically introspective, frequently very egotistic and inclined to live within themselves. They think that their parents are less fond of them and show favors to their brothers and sisters. They thus come to be very subjective and live in a realm of fancies and ideas, are notoriously poor observers of fact as entities and poor scholars in the exact sciences. If they are recognized as different in these early stages much may be done for them by appropriate psychoanalysis. After reaching years of independence these patients find it difficult to get along with people. They are suspicious and quarrelsome and soon come to believe that they are the objects of special plots and persecutions. The early childhood ideas may be a nucleus for this delusional type of thinking. This false interpretation of conditions about them becomes more and more fixed in their minds until it is systematized and everything is woven into the fabric of this belief. Many persist in this state for years. They may be engaged in business, but are more apt to follow some solitary pursuit. Here their eccentricities, if coupled with a small modicum of talent, are put up with and they go along as actors, painters, musicians, writers, inventors, etc., earning perhaps a bare living or being half supported by friends, while they are laying the foundations of a «career.» Often the ideas of persecution lead to the development of intense hatred, it may be of an individual as a personal aggressor or as a hindrance to the cause of truth, of liberty, of freedom, etc. It thus comes about that many paranoiacs are attracted by the doctrines of anarchy and it is notorious that regicides are prominently represented in this diseased type. Some of these patients at periods of excitement suffer from hallucinations; they see faces, hear voices plotting against them, etc. Sometimes these voices seem to accuse them of immoral acts. From ideas of persecution they often graduate into ideas of grandeur (see GENERAL PARESIS). Sometimes the voices appear to tell one of these that he is elected by God to be the savior of his people and in response to either set of hallucinations he may kill. Mystico-erotic ideas are very frequent in women of this nature and many are found studying Oriental philosophies and mystic symbolisms from fakirs who hold their hands and teach them breathings, intestinal lavage and various forms of massage — all of which contribute to their erotic tendencies. One feature is very characteristic in this disease — its onesidedness. On many of the topics of general conversation the paranoiac is rational and often a charming talker; but touch the core of his delusional state and he is transformed. Some part of his thinking necessary to bring about mature judgments along certain lines is defective. This defect has never yet been seen by the microscope, but there seems to be little doubt that some organic brain defect may develop. Most of these cases are hopelessly incurable. A few remit, are apparently self-controlled for a time and then develop. The majority go on to a mild form of dementia, but the breakdown is very slight, although the delusions usually persist and dominate the patient's whole thought and actions. The anti-social patients are best confined in sanatoriums. They are nuisances to all and are better under the strict régime of an institution. Much can be done by early individual training to render these defectives self-supporting. Consult Jelliffe and White, 'Diseases of the Nervous System' (3d ed., 1919).

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Editor, 'Journal of Nervous and Mental Disease.'

PARANTHRACENE. See Anthracene.

PARAPEGM, in ancient times the name given a tablet fixed to a pillar or wall and on which laws and proclamations were engraved.

PARAPET, (1) in fortification, a work, usually of earth, intended to protect the troops within the ramparts, as well as the pieces of artillery used in the defense. It has three sloping surfaces, an outer, upper and inner; but the upper surface slopes very gently downward and outward. It is intended for the defenders to rest their rifles or muskets on when firing. The defenses round the roofs of castles are also called parapets. (2) In architecture the term parapet is applied to the structures placed at the edges of platforms, balconies and roofs of houses to prevent people from falling over.

PARAPLEGIA. See Paralysis.

PARASANG (Gr. *παρασαγγης* from Persian *parsang* or *farsang*), the denomination of a lineal measure among the Persians of antiquity, and still used by them. In Xenophon's account of the Retreat of the Ten Thousand he gives the length of each day's march in parasangs, and modern travelers agree with the estimate he makes of its length, namely about 30 Greek stadia. Herodotus makes about the same estimate, which in English miles would be a little less than three and one-half. Strabo, the geographer, reckons it as an arbitrary measure of 30, 40 or even 60 stadia, and the nature of the ground traveled over may sometimes have had some influence in determining the question. The derivation of the word, which means "stone-at-the-end," points to the fact that the Persians, like the Romans, marked out their great highways by means of stones, inscribed with the distance in one case from the Persian capital, in the other from the "golden milestone" (*milliarium aureum*) which Augustus set up in the Forum near the temple of Saturn.

PARASELENE, *in astronomy,* a mock moon, not unlike the Parhelion, or mock sun. The Paraselene is common in the polar regions. See Halo.

PARASITES. A parasite is an organism which draws its sustenance from some other living thing on the surface of which or within the body of which it lives. The organism upon which it depends is known as the host. Either parasite or host may be equally either plant or animal. The plant parasites, which include such forms as molds, rusts and especially bacteria, are found in and upon all sorts of plants and animals and are the cause of a variety of diseases that assume in different places and at different times great economic importance for man and also affect him directly and seriously in the form of a multitude of human diseases. The phytoparasites just noted are not specifically discussed under this heading, but are treated in individual articles dealing with the groups mentioned. The zoo-parasites that form the subject of this special discussion are less widely known. They stand in the same relations both to plant and animal hosts that have been enumerated above for the phytoparasites. Recent discoveries have shown them to be of far-reaching importance in their attacks upon domestic animals and still more as the cause of human diseases. The group of animal parasites is not a systematic subdivision for the animals embraced under this heading are related biologically rather than structurally. Some branches of the animal kingdom like the Echinoderms contain no species of parasitic habit; among the vertebrates only a couple of types like the lamprey and the hag-fish manifest a parasitic habit; still other groups like the mollusks and sponges possess a few parasitic species. On the other hand the large majority of the flat worms and round worms are parasitic although in these phyla some small groups like the Turbellaria are free living. Among other groups like protozoa and arthropods the balance between free living and parasitic forms is more nearly even. This situation emphasizes the fact that parasitism is an acquired habit and this fact is abundantly demonstrated by the structure of parasitic species which shows a general likeness to that found in the free living forms yet manifests modifications directly relating to the discharge of function under conditions of parasitic existence.

The secondary character of parasitism is still further demonstrated by the wide range in degree and type of dependence exhibited by different species. In fact the various grades merge into one another so perfectly as to produce a scale of dependence that passes almost unbroken from the free living type to the most extreme parasitic organism.

These conditions are well illustrated by the barnacles (*Cirripedia*). At one end of the series stand the ordinary sessile species which are sometimes attached to the external surface of a whale as to rock or a floating object in the ocean and have no special biological relation to the organism which serves them for mechanical support. Contrasted with this are forms that seek a location within the jaws of the whalebone whale and profit by the organisms carried past them in the current of water surging through the plates of baleen while the whale is feeding. While these fall within the class of messmates or commensals and are not far removed from such as are true parasites, yet it will be noted that they do not draw sustenance from the animal itself. One member of this same group, *Sacculina,* has acquired a true parasitic habit and has become radically modified in the process. The adult is a shapeless mass firmly attached beneath the "apron" of a crab. Its relationship to the barnacles is evident when one considers the free-living young and the first stage after settling down on the abdomen of the crab which serves as host. The antennæ used by other barnacles purely as organs of attachment develop here into an extended system of rootlets which permeate the body of the crab and serve to absorb food for the parasite.

Transition to parasitism is exemplified equally by various types of flies. There are those which live upon decaying material; others in which the mouth parts are adapted to piercing that suck the blood of various hosts, move from individual to individual and lead a vigorous independent existence. Finally the sheep tick (*Melophagus ovinus*) is really only a highly modified biting fly that has lost its wings, given up largely the power of independent movement and assumed a more intensive parasitic existence.

The relation between the parasite and the carnivore is well illustrated by leeches. In this group there are those species which manifest a purely carnivorous habit; others that parasitize upon larger animals and remain only long enough for a single meal while still others remain attached to the exterior of fish or turtles as permanent external parasites.

One sees in the temporary parasitism of the mosquito or bedbug evidently the first step toward the stationary parasitism of the fleas and lice, but such ectoparasites or epizoa are after all less highly specialized than the endoparasites or entozoa. Ectoparasites which are very common on the surface of aquatic animals are reduced among air-living species to the members of the group of arthropods whereas the soft-bodied forms like protozoa and flukes that occur on the external surface of water-living hosts have been necessitated to accept a more favorable location when the host entered upon a terrestrial existence and the external surface was hardened to the horny skin of the higher vertebrate. Natural openings furnish points of entrance by which such ectoparasites were led to invade the mouth, lungs and alimentary canal or the cloaca and bladder where are found to-day species whose close relationship to forms parasitic on the external surface of related water-living hosts is too clear to fail of recognition. Most of the entozoa belong to the systematic groups of protozoa, trematoda, cestoda and nematoda. They represent the most highly specialized members of the group and have become modified by adaptations to the parasitic mode of existence which are most numerous and striking.

The majority of internal parasites are found in the alimentary canal or some organ connected with it and owe their introduction to the contamination of food or drink. Yet there is no part of the body which is immune to parasitic attacks as certain species occur regularly in the muscular system, or the circulatory system, while even the brain and special sense organs are not without such guests.

It is interesting to note that certain species which are ordinarily free-living may under circumstances assume a parasitic habit. Thus protozoa common to slime of ponds or streams when introduced accidentally into the human alimentary canal may find possibilities for developing temporarily in the rectum. Nematodes like the vinegar eel have been found as apparently successful inhabitants of the human bladder and small leeches common in the wayside pools when drawn into the throat by man or animals drinking may thus become accidental parasites of a temporary character.

Schaudinn has called attention to the ease with which slime-inhabiting species of microscopic animals, especially protozoans, may accidentally gain access to the alimentary system of man, and find there conditions such that they may indefinitely continue their existence. Small roundworms (*Rhabditis nigrovenosa*) thrive apparently equally well in the mud or in the lung of the frog, although the method of reproduction becomes modified in the second instance.

The relations of animals to one another show also many degrees of dependency which suggest another line of origin for the parasitic habit. In the simplest case of dependency the weaker form receives shelter or even only transportation from point to point. Such are the conditions for those forms which take up their abode upon floating objects in the water, the backs of whales, or the outer surface of the shells of crabs and mollusks. Some, indeed, seek more sheltered positions, as for instance among the windings of a snail's shell or within the mouth of the whale. In the latter case the animal secures not only the best of protection but is able to pick up stray morsels of food as well. The dependent secures board as well as lodging from the host, and the relation is known as commensalism (q.v.). In some instances, however, it may be of mutual advantage, and some return may be rendered for the services performed. In the latter case the relation is known as mutualism, or symbiosis. The association here is well illustrated by that of the anemone which is regularly found attached to the shell of a hermit-crab. The anemone secures transport from point to point, greater freedom from injury, together with less dependence upon environment, than is ordinarily true of sensile organisms, while at the same time it appropriates stray morsels which fall from the jaws of the crab while feeding. On the other hand, its presence on the shell favors the concealment of the crab, and its stinging tentacles ward off possible attack. The advantage of the association is demonstrated by the solicitude with which the hermit-crab transplants the anemone when forced by growth to take a new shell for its habitation.

Diametrically opposed to this mutual advantage which has grown out of the association of lodgers and messmates is that in which the return is purely one-sided, namely, true parasitism. The parasite lives at the expense of his host without rendering any service in return, and yet with such prudence as not to endanger the life of his supporter until at least his own life-history is completed. The precision of the relation is evinced for instance by the life-history of the ichneumon-flies. The eggs are deposited in cases on the back of caterpillars; the larvæ penetrate the body of the latter and, beginning with the least important organs, devour the tissue of the host until with its complete destruction each larva is ready to metamorphose into the fly. It is but a short step from the position assumed by some lodgers in the mouth-cavity to that taken by most parasites in some region of the alimentary canal, or in one of the various organs connected with it; and yet the transition is not always to internal parasitism (endoparasitism). Existence on the external surface of the host, which distinguishes the ectoparasite, though rare on account of the greater dangers involved, presents examples of an equally intense parasitic habit. Beneath the abdomen of the crab occurs often a curious sac-shaped body (*Sacculina*) which is a near relative of the barnacles, a group of typical sessile forms. The relationship is little evident from the inspection of the adult, but is clearly demonstrated by study of the life-history. The young organism settles down on the crab, similar in form and development to a young barnacle, but develops organs of attachment which ramify through the body of the crab as do the roots of a tree through the soil, and are the sole means of obtaining nourishment. Accompanying the assumption of the parasitic habit comes the striking degeneracy of organs connected with the active life and the development merely of the reproductive function. The adult *Sacculina* consists of little more than a mass of reproductive organs producing large numbers of eggs.

Effects of Parasitism.— The effects of parasitism, which are dependent upon the degree to which the animal has acquired the parasitic habit, are equally evident and similar in parasitic forms, whatever their line of origin. The organs and function of locomotion are the first to suffer. Adult parasites possess little if any means of movement and such locomotor organs as are present in the embryo, and are related to a period of free existence or to a change of host, disappear with the attainment of the adult location. Hand in hand with the degeneration of the locomotor organs goes the reduction in the muscular and nervous systems. Organs of special sense, also, become atrophied or are entirely lost, and the parasite is degraded to the level of a mere vegetative organism by the disappearance of these characteristically animal structures.

On the other hand, while the parasitic life is an easy existence, it is equally a dangerous one for the species. Were the eggs to be deposited and the young developed at the point where the adult lives, the existence of the parasite and its host would find an evident and not distant limit. The necessary migration to the external world and search for new hosts involve large elements of chance. Thus for the preservation of the species a superabundant fecundity is required to meet these overwhelming odds. In conformity to this the reproductive system of the true parasite reaches an extraordinary stage of development, and produces an enormous number of offspring. It is noticeable that the same changes are brought about in the worm and in the crustacean. Unlike as they are at the start parasitism has degraded them to the same physiological level. Those organs which characterize the animal are lost and there remains merely a superdeveloped reproductive system. It is wise in this connection to emphasize the fact that the parasites do not constitute a group of systematic value. The forms are classified in distinct and separate branches of the animal kingdom, and a given parasite is often more closely related to free-living species than to other parasitic forms. The majority of animal parasites occur to be sure among the lower groups so that the single-celled animals (Protozoa), the worms, and the Crustacea, furnish the larger number of parasitic animals, although instances of parasitism are not wanting in higher groups, even among the vertebrates.

Parasites do not originate in vitiated organs, as the ancient worthies of medicine would have it, nor are they the result of any peculiar temperament, as another school has held in time past. They have been introduced into the body of the host from without, and are found in a given location because the germs or embryos were brought to that point by some chance, and have maintained it during growth. The method of cure is equally evident. No amount of imagination can compass it, for it depends upon the removal of the parasite and the prevention of the introduction of further germs or embryos. The same line of reasoning applies with equal distinctness to other diseases, and if followed will materially aid in dispelling many popular illusions of the day on medical subjects.

Endoparasites.— The endoparasites of man have been centres of attention during recent years by virtue of discoveries which have demonstrated their importance in the etiology of disease. To be sure the occurrence of tapeworms, and of the larger roundworms, is recorded in the first medical writings of the Greeks, and also in the still earlier chronicles of the Hebrews and Egyptians, and in a few instances their relation to disease was accurately stated. Now more than 150 species are recorded for the human host, and the discoveries of recent years have been particularly fruitful among the lower groups of these organisms. For instance, it is now known beyond question that a small parasite in the red corpuscles is the cause of malaria (q.v.), one of the most widespread and costly of human diseases. Quite recently also smallpox, yellow fever and a number of tropical diseases of considerable importance have been attributed to the presence of other minute animal parasites. Although not yet demonstrated it may well be that the causes of many infectious diseases which have hitherto been sought in vain among the bacteria are eventually to be found among microscopic animal parasites.

In the opinion of the medical profession 200 years ago there was no disease, real or imaginary, which was not due to the presence and effect of some kind of parasite. More careful study has shown the extreme character of this view, and has given some insight into the actual effects of the parasite upon the host. In general such effect is related to the proportional size and number of the parasites, although there is an evident difference between such parasites as are active and growing and those which are encysted and passive. The draft on the host is first for food supply, which evidently depends upon the size and fertility of the parasite; in the second place upon the amount of space occupied, which will be of importance only where the number of parasites is large or the space occupied is limited; and in the third place, active parasites produce by their movements a certain irritation and inflammation of the tissues of the host. Certain species which actually devour the tissues of the host introduce an element of danger in the destruction of essential organs and through weakening the walls of blood vessels or perforating the intestinal canal, so that the secondary consequences may be entirely out of proportion to the actual destruction caused. Excessive effects are, however, due to more intricate causes. The extreme anæmia which is consequent upon the parasitism of certain species (*Necator americanus*) is due to the constant abstraction of blood by the parasite, and the consequent great reduction in the vitality of the host. The injuries caused in the intestinal wall afford places of easy attack for pathogenic germs which may be present. Many investigators have also shown that certain species of parasitic worms produce definite poisons (toxins) which affect particularly the nervous system and the formation of blood. The continued production and giving off of such substances explain the apparently excessive results of parasitism, and the production for instance of pernicious anæmia by certain tapeworms, such as *Dibothriocephalus*.

Causes and Results.— The life-history of the parasite is intimately connected with the habits of the host, and frequently includes alternation of generations in that one generation is passed within the host and another either outside as a free-living organism or in a different host; or it may be that the larval form occurs in one host, while the adult is found in another. Thus the larval form of one tapeworm occurs in the mouse, and the adult is found in the alimentary canal of the cat. The complications which occur are too extensive to permit of detailed consideration here, but the relation of the two hosts is regularly such that the transition from one to the other is achieved by natural means. The life-history gives a clue to the means by which the parasite gains introduction to the host, and in the absence of knowledge concerning the development it is difficult if not impossible to say at what point the evil may be combated. A rational prophylaxis for malaria was not given until the life-history and the method of introduction of the parasite into the human host were laid bare. In general the causes of human parasites are to be found in the disregard of personal cleanliness on the part of the individual, in too intimate association with pet animals, from which come a number of important parasites, in the contamination of the water-supply by sewage or waste, in lack of care in the preparation of food and, of course, frequently in the element of chance.

Parasitic diseases did not affect savage man widely. While conditions of existence were very unsanitary, those who fell seriously ill were deserted and a new place of habitation sought out. Thus the sources of contamination were left behind and the epidemic stopped. When man began to live in fixed communities opportunities were given for rapid increase in the number of his parasites and for their transmission to others. Food and drink were readily polluted and epidemics became frequent and virulent. Thereby the race developed in the course of a long period a certain immunity such as is seen to-day in the resistance of the black race to the evil effects of hookworm disease. This was acquired doubtless at a fearful cost in human life as evidenced by the present effects of new diseases on non-acclimatized races or groups.

With the development of community sanitation and especially with the emphasis on pure water, and with general education in personal hygiene the abundance of animal parasites and the chances of infection have been markedly reduced. The use of foot coverings and less intimate association with domestic animals are also important factors. The demand for good food with consequent greater care in raising, preparing and distributing food products also tends to reduce and ultimately to eliminate zooparasitic diseases. When national customs or prejudices run counter to the favorable influences mentioned, certain animal parasites may become abundant and serious, but the increasing knowledge and intelligence of man will ultimately control and zooparasitic diseases will disappear. Thereby man will surmount the greatest barrier to the control of the tropics and the utilization of its wonderful riches for the welfare of the race.

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PARASITIC ANIMALS. These are generally tabulated under the headings of protozoa, worms and insects. Of the Protozoa group, *P. rhizopoda*, some amœbæ are parasitic, *P. sporozoa* are all parasitic, and there are numerous parasitic forms of the *P. infusoria*. The two first mentioned are productive of malaria in humankind. Of the Scolecida group, *S. trematoda* — liver flukes — the *S. cestoda* — tapeworms — and the four genera of *S. acanthocephala*, are all parasitic; the *S. nematoda* — roundworms — are also mostly parasitic. Of the Annelida group, some species of *A. chætopoda* — sandworms — are parasitic, while most species of *A. hirudinea* — leeches — are ectoparasites, or temporary parasites; some leeches are carnivorous. Of the Insecta group, besides many plant parasites the group of animal parasites include *pediculidæ* — lice; *membranacci* — bed-bugs; *aphaniptera* — fleas; *mallophaga* — bird lice; *pupipara* — sheep lice; *culicidæ;* mosquitoes and other *diptera*; ichneumon flies; and among the Arachnida group of spider parasites, are mites, water mites, itch and mange mites and ticks. See PARASITES; PARASITIC DISEASES.

PARASITIC CONE. See CONE.

PARASITIC DISEASES, the name applied to such human and animal diseases as are caused by animate agents, of which there are two types — parasites and infectious agents. While the latter produce "infectious diseases," they are in a sense parasites, though they may also be saprophytes — vegetables organisms living upon dead organic matter. The true parasite, however, is not an infectious agent; it confines its habitat to certain localities of the living body and remains there. It is milder in action; its life being intimately bound up with that of the host upon whom (or which) it lives, there seems to be an absence of "intent" to destroy that host. On the other hand, the infectious agents enter every tissue of the living body and destroy it as speedily as may be. Yet parasites and infectious agents are not necessarily distinct organisms, for types of the former exist harmlessly in perhaps every human body. See PNEUMONIA.

The various diseases are dealt with in separate articles. They may be produced by vegetable or animal parasites, while a third form of infective diseases, such as influenza, whooping cough, small-pox, measles, typhus fever and mumps, have not been definitely traced to micro-organisms. The diseases arising from vegetable parasites are erysipelas, infective endocarditis (affecting the internal membrane of the heart), gonorrhœa, suppuration and blood poisoning. Specific bacilli, those which always provoke the same disease, cause typhoid fever, cholera, yellow fever, infective meningitis, diphtheria, pneumonia, Malta fever, Weil's disease (a form of jaundice), tetanus, relapsing fever, plague, glanders, leprosy, tuberculosis, madura foot, actinomycosis, asperghosis and other fungus diseases. To animal parasites (protozoa) are due the tse-tse fly disease, sleeping sickness, amœbic dysentery, syphilis (unknown origin), malaria, Kála-ázar (an Indian fever) and black-water fever. The *filaria* or nematode parasitic worms are found in various organs and in the blood. Scarlet fever and hydrophobia have also been traced to organisms. Investigations carried out in Alexandria, Egypt, during 1916, into the spread and incidence of intestinal protozoal infections of British troops and natives in the Near East revealed three new human intestinal protozoa. The following list shows the localities of the human body and the principal parasites that are found in them:

ENTOZOA.

Blood	Filaria sanguinis hominis.
Brain	Acephalocystis multifida.
Bronchial glands	Filaria bronchialis.
Bronchial tubes	Eustrongylus bronchialis.
" "	Strongylus bronchialis.
Capsule of crystalline	Distoma mobium.
Crystalline	Monostoma lentis.
Duodenum	Distoma crassum.
Eye	Filaria oculi.
Gall bladder	Distoma hepaticum.
" "	Fasciola hepatica.
Hepatic duct	Distoma lanceolatum.
Intestines	Ankylostoma.
"	Anthomia canicularis.
"	Ascaris alata.
"	" lumbricoides.
"	" mytax.
"	Bothriocephalus cordatus.
"	" latus.
"	Cysticercus tenuicollis.
"	Distoma heterophyes.
"	Ditrachyceras rudus.
"	Eustrongylus gigas.
"	Œstrus hominis.
"	Pentastoma constrictum.
Intestines	Pentastoma denticulatum.
"	Tænia acanthotrias.
"	" elliptica.
"	" flavapuncta.
"	" lophosoma.
"	" mediocanellata.
"	" nana.
"	" solium.
"	Tricocephalus dispar.
"	Sclerostoma duodenale.
Kidney	Eustrongylus gigas.
"	Ascaris renalis.
"	Tetrastoma renale.
Liver	Tænia nana.
"	Acephalocystis endogena.
"	Pentastoma constrictum.
"	Echinococcus hominis.
Muscles	Trichina spiralis.
"	Cysticercus cellulosæ.
Omentum	Echinococcus hominis.
Ovary	Hexathrydium pinguicola.
"	Polystoma pinguicola.
Portal and venous system	Bilharzia hæmatobia.
Portal and venous system	Distoma hæmatobium.
Skin and areolar tissue	Dracunculus medinensis.
" " "	Filaria medinensis.
Spleen	Echinococcus hominis.
Urinary bladder	Dactylius aculeatus.
"	Diplosoma crenatus.
"	Spiroptera hominis.
Venous system	Hexathrydium venarum.
" "	Polystoma venarum.

ECTOZOA.

This class includes the varieties of lice, the chigoe and itch-insect, which infest the skin, cellular tissue and the hair.

The chief vegetable parasites, Entophyta, those living within the body, and Epiphyta, those living on the exterior, occur as follows: In the stomach, Torula cerevisiæ (also in the bladder); Sarcina ventriculi. The Oïdium albicans or thrush-fungus occurs on cutaneous and mucous surfaces; in the mouth, where also Leptothrix buccalis is found. The bones of hands and feet and deep tissue are affected by Chionyphe carteri. On the scalp, Microsporon audouini; Trichophyton sporuloides; Achorion lebertii. The skin, Puccinia favi; Achorion schoenleinii; Microsporon furfur; follicles of hair, Microsporon mentagrophytes. See BACTERIOLOGY; DISEASE, GERM THEORY OF; PARASITES; PATHOLOGY.

PARASITIC FISHES, about a dozen very small eel-like fishes, of the sand-eel family *Ophidiidæ*, and the genera *Fierasfer* and *Encheliophis*, are parasitic or commensal in other marine animals, and have some curious modifications. They frequent the hollows in the bodies of jellyfishes, the breathing chambers of starfishes and sea-cucumbers, and sometimes insinuate themselves between the layers of the mantle of pearly mussels and other bivalves. Cases are known where they have become coated over with pearl and so imbedded in the interior of the shell. These parasitic fishes have totally lost their pelvic and caudal fins; and the vent has been moved forward from the ordinary anal position to near the throat. One species (*F. affinis*) is especially common on the pearl-oyster banks of western Mexico.

PARASITIC PLANTS, plants which live upon and at the expense of other plants to which they become attached. The group is not well defined, since many of the lower forms have saprophytic habits also, or may develop them under favorable conditions and since some higher plants exhibit more or less parasitic tendencies. All members of the group are alike in their method of feeding: sucking organs (haustoria) are developed within the host-plant's tissues, their office being to absorb the liquids which the host-plant obtains from the soil and the food elaborated by the green parts of the host. It is assumed by botanists that this habit has resulted in sexual degeneracy, so that in some cases sexuality appears to have been lost entirely. As a consequence of this the vegetative functions are in many cases remarkably developed. In other cases the life-history is remarkably complex, especially among the lower fungi, for instance, apple-rust. (See Apple, paragraph *Diseases*). The flowering parasitic plants may or may not contain chlorophyl, in the former case being able to utilize the carbon dioxide of the air in the manufacture of a part at least of their food; in the latter case being dependent nearly if not entirely upon the host. Familiar instances of the former are bastard toad-flax and mistletoe; of the latter, broom-rape and dodder. This last (see Dodder) is remarkable also because its seeds germinate in the ground, send up slender leafless, thread-like stems, and after becoming attached to a host die at their lower extremities. Single individual plants of some species of dodder have been known to feed upon more than half a dozen different species of host-plants at the same time. From an economic standpoint, the parasitic fungi are of most importance. Among these are the so-called plant diseases; for instance, the smuts and rusts of cereals, the blight of strawberries and potatoes, the mildew of gooseberries and grapes, etc. There are also several diseases attributed to bacteria; for instance, pear blight and melon wilt. Still other members of this group are parasitic upon insects. The common house fly is frequently found stuck fast to walls and windows and surrounded by a yellowish ring of spores of a plant parasite. Young fish in hatcheries are often destroyed in immense numbers by a slime mold. Horses occasionally suffer from a lung parasite of vegetable origin. And even man is not exempt; he is sometimes attacked by ringworm and barber's itch. The attacks of these parasites are due largely, if not wholly, to unsanitary conditions, carelessness, neglect, or some other similar cause and they may be prevented by proper attention.

PARASOL, an umbrella or covering for the head, which was used among the ancients, not for the purpose so much of preservation from the rays of the sun as in religious ceremonies and processions. In certain festivals the young females who celebrated them bore, among other sacred instruments, the parasol: it was, in fact, one of the most ancient marks of dignity that we find indicated either by relics of art or by authors. In process of time, when the Romans began to lay aside the simple habits of their forefathers, the parasol, by a natural transition, began to be used for the purpose to which it is still applied. The matrons particularly used to be followed by slaves, whose office was to protect the delicacy of their charms by intercepting the solar heat by the agreeable shade of the parasols. They were constructed of wands or twigs, disposed in such a manner as to admit of their being put up or down, in much the same way as those used at the present day. See Umbrella.

PARASUCHIA, an order of extinct crocodiles. See Herpetology.

PARAY-LE-MONIAL, pä-rā-le-mō-nē-äl, France, town in the department of Saône-et-Loire, on the Bourbince, about 170 miles in direct line southeast of Paris. It is one of the oldest towns in France, and is famous for having been the home for many years of Margaret Mary Alacoque, a Visitation nun, who gave the world an account of remarkable revelations made to her regarding the devotion to the Sacred Heart of Jesus. To this nun may be given the credit, in a great degree, of the present magnitude of the League of the Sacred Heart (q.v.). She died at Paray-Le-Monial, 17 Oct. 1690. Pop. 3,000. Consult Tickell, 'Life of Blessed Margaret Mary'; Bougand, 'Histoire de la bienheureuse Marguerite Marie' (1894).

PARBUCKLE, a method of raising or lowering any cylindrical body, such as a barrel, by an inclined plane. It consists in throwing a rope round a post fixed on the level from which the object is to be lowered, or to which it is to be raised, making the ends of the rope of the same length and passing them under and round the object to be raised or lowered. In raising or lowering the object one or more men, standing on the higher level, take hold of each end of the rope, and shorten or lengthen the amount of rope paid out according as they wish to raise or lower. By this method the barrel, or whatever else it may be, is made to serve as a pulley for itself. The resistance at the two ends of the rope is just one-half of the weight of the object as felt on the inclined plane, or one-fourth of that weight at each end separately.

PARCÆ, pär'sē. See Fates.

PARCEL, was formerly used as an adverb or semi-adverb, having the meaning of «partly» or «in some measure»; as in the expressions «parcel-blind,» «parcel-deaf,» «parcel-gilt» or «parcel-learned.» In the law of real estate and conveying of property, the word is used for a portion of land named in the transaction of buying or selling, and so also of a description of property set forth in a conveyance, together with its boundaries, with a view to its easy identification. In nautical usage, a parcel is a wrapping of tarred canvas on a rope, to prevent chafing. It is cut in long, narrow strips, well tarred, and made up into rolls before it is laid on the rope. The rope is usually warmed, then parceled and then served.

PARCEL POST. The generic name for a service performed by governmental agencies and comprising the collection, forwarding and delivery of packages through the mails. It corresponds in a general way with the service performed by the express companies, which until the summer of 1912 were in exclusive possession of the field in the United States. At the time mentioned nearly all European and one or two South American nations, as well as Japan in Asia, were provided with systems for the transportation of merchandise in retail quantities, but within generous weight and bulk limits, at considerably less than one-third the cost of expressage in this country. The United States post office would receive no parcel of merchandise over four pounds in weight and charged a prohibitive uncial rate. In Belgium the maximum weight transportable in the mails was 132 pounds; in Russia it was 120 pounds; in Germany, Switzerland, Hungary, Rumania, Luxembourg, Sweden and Norway the permissible mailable weight was 110 pounds, while in Austria there was no legally prescribed limit. But the parcel post charges being four or five times the prevailing freight rates, the use of the mails for very heavy shipments was practically precluded. Only 5 per cent of the number of packages forwarded by express in this country weigh over 100 pounds and universal experience attests this to be the usable limit of the service. In Great Britain, where the maximum mailable weight was 11 pounds, a package express service had been instituted by the railways themselves. Fish, game, and farm and dairy 'products, for instance, could be shipped 50 miles at the rate of about 12 cents (sixpence) for parcels up to 24 pounds and one-half cent a pound for greater weights without limit. For longer distances the rate increased, but the highest charges were 18 and 30 cents, respectively, for 10 and 24 pounds carried a distance of 200 or more miles, with a 1¼ cent pound rate for greater weights. Railway transportation rates in England are graduated down to two pounds for all classes of freight and a collect and delivery service is attached in all cases. The minimum parcel post rate in Continental Europe is about six cents per package. Comparisons are difficult because of the variations in the tariffs and practices, the rates being zonal in some countries, while in others there are no differentials for distances. Taking the most comparable items we find that in England 10 pounds of any kind of merchandise could be shipped 50 miles by railway express and delivered to the designated consignee for 16 cents; in France a parcel of like weight (5 kilograms or 11 pounds) could be sent any distance by post and delivered for 16 cents; in Germany and Austria the postal rate for parcels up to 11 pounds in weight would be six cents for distances of 46 miles or less, and 12 cents for greater distances, with an additional charge of two and a half cents for delivery in cities and five cents in rural districts. The maximum rate for such a parcel would, therefore, be 17 cents, delivery charge included. The average rates of seven foreign countries for a postal parcel of five kilograms delivered in the first zone (approximately 50 miles) was eight cents; the minimum express rate in the United States was 25 cents for the least weight and distance. Besides being high in cost the express company service is incomplete — deliveries and collections are made only in urban communities. Both defects are irremediable. The rural free delivery system maintained by the government as a public service could not be articulated with an express business conducted for profit by 10 separate private corporations. The 25-cent rate is an irreducible minimum, representing as it does the per parcel expense for way-billing, recording, transcribing bookkeeping and intercorporate accounting between express and railroad — the expense being the same for a one-pound package as for a carload. By the affixment of a postage stamp of the required denomination these economically indefensible and wasteful processes would be eliminated.

The cost of collecting and delivering parcels of 10 pounds and upward in weight, ascertained by express company and mercantile experience, is about five cents. According to postal experience the cost is much less for smaller parcels. The railway mail pay for transporation is one cent per pound for 250 miles, or two cents for 10 pounds for 50 miles. A parcel post rate of eight cents for 11 pounds within a zone of 50 miles (which is the averaged European rate) would, therefore, be quite feasible in the United States. The introduction of zonal rates into the parcel post of this country was strongly combated, but the unfairness to local shippers of flat rates that would be high enough to prevent an enormous postal deficit is self-evident. And, to say nothing of their killing effects on the short-journey traffic, embracing nearly the entire business, such rates would cheat the government on the long journey. A weight limit, if too low, would hinder the free movement of the traffic most in need of the facilities afforded by a parcel post. Express company shipments average 33 pounds in weight; the country merchant deals in lots approximating 100 pounds; in the "farm-to-kitchen" trade a worth-while market basket would not weigh under 50 pounds. The Parcel Post Law, adopted in the form of a rider to the postal appropriations bill of 23 Sept. 1912, embodied a zonal rate system. The rates, however, were made needlessly high — the postage on a 10-pound parcel sent a distance of 50 miles was 32 cents, four times the feasible rate in this country and the averaged foreign rates. The zoning was absurdly complicated by the division of the national area into blocks of 30 miles square. The weight limit was fixed at 11 pounds. Notwithstanding these drawbacks an enormous traffic in small parcels immediately developed. The law contained a provision permitting the Postmaster-General by administrative act, with the concurrence of the Interstate Commerce Commission, to change the rates, zones, weight limit and classification of the parcel mail in such manner as to produce the best results. The weight limit was increased during the summer of 1913 to 20 pounds for all zones and in January 1914 to 50 pounds in the local and first and second zones. These two zones have been consolidated; the zoning has been otherwise simplified and there has been a radical reduction of the scale of rates. An epitome of the present parcel post tariff for the nearer zones follows:

WEIGHT IN POUNDS	Local rate	Zones 1 and 2, 150 miles	Zone 3, 150 to 300 miles
1	5c	5c	6c
2	6	6	8
3	6	7	10
4	7	8	12
5	7	9	14
10	10	14	24
20	15	24	44
30	20	34	weight limit
40	25	44	
50	30	54	

For the fourth zone the rate is seven cents for one pound and increases four cents with every additional pound; for the fifth zone the initial rate of eight cents increases six cents with each added pound; for the sixth zone it is nine cents for one pound and eight cents for each pound additional; for the seventh zone the rate is 11 cents for one pound and 10 cents added for each pound above that; for the eighth zone the rate is 12 cents for each pound, which applies to all points more than 1,600 miles from the office of mailing, including Alaska, Hawaii, the Canal Zone, Guam, Tutuila, the Philippines and Shanghai. Zone keys are provided for each mailing office whereby the zone of any office of address can be ascertained without the use of maps.

The domestic parcel post reaches more places than any other transportation agency, and small parcels may be sent long distances at less cost than in any other postal service in the world. The rates for nearby zones are particularly advantageous and encouraging of direct dealings between producer and consumer. Special treatment is accorded to shipments of farm products weighing between 20 and 50 pounds. Parcels may be insured against loss or damage and sent C. O. D. The government will assume liability in the former case up to $100, the rates being graded from 3 to 25 cents according to the amount of insurance. C. O. D. collections will be made up to $100. Parcels, furthermore, may be registered, without insurance, for a small fee — a privilege which is taken mostly by mail order houses, but also by others who wish to keep a receipt as a record. On the basis of the latest official reports the number of registered pieces is approximately 37,000,000 in a year; the number insured about 35,000,000, and the number sent C. O. D. about 7,000,000. The C. O. D. collections amount to nearly $50,000,000 in a year, for which about $450,000 were received in money order fees. The fees for registration and insurance in 1917 amounted to $3,237,195. The total weight of parcels handled was about 2,000,000,000 pounds, with an average of about two pounds, and seven cents postage paid per parcel, indicating a postal revenue of about $70,000,000 from this source.

The first consequence of the institution of the parcel post on the express companies was a drop of about 20 per cent in their annual operating revenues. In its report of 1913 the Interstate Commerce Commission asked to be relieved of its duty to «determine the extent to which the parcel post should supersede the express system,» saying, that a proposition to reduce the postal rates might conceivably be destructive of existing companies before adequate provision had been made by the government to take over all of their business. One of the five larger companies discontinued operations on 1 July 1914. Under regulations prescribed by the Interstate Commerce Commission and put in force 1 Feb. 1914, the gross income from express forwarding operations gradually increased and by 1916 was restored to nearly its previous annual normal of about $100,000,000, the realized net income for the year mentioned having been $10,614,727. The regulations fixed the forwarding charges on the basis of the most direct route between any two given points; they abolished double rating (for shipments carried over the lines of more than one company) and effected «substantial» reductions (about 8 per cent) in class rates which, of course, did not make them competitive with postal rates. Commodity rates remain at about their previous level. The rules thus prescribed have been adopted by nearly all the States as regulatives of their intrastate express business, with resulting advantages to both shippers and forwarders, particularly the elimination of the difficulty of quoting the correct rate. The greater part of their operating revenue is now derived by the express companies from transportation, in wholesale quantities, of commodities requiring quick delivery; and this field will be occupied by them permanently unless the government or the railroads themselves should establish an express freight service. While the parcel post absorbed about $20,000,000 per annum of package express business, it developed three times that amount on its own account; and the potential growth of the parcel post has only begun. What has been witnessed is merely indicative of the enormous volume of traffic that has remained immobile for the lack of means to move it conveniently and at rates which it could bear.

Stephen Pfeil.

PARCENARY, *in law,* is the state or estate of two or more persons, called *parceners,* who hold title, as equal heirs to land, each with a right to a separate share of it, even though undivided. This, of course, carries with it no benefit of survivorship.

PARCHE, one of the small but gorgeous coralfishes known best as «butterfly-fish» (q.v.).

PARCHIM, a town in Germany, in the Grand Duchy of Mecklenburg-Schwerin, situated on the Elbe, about 20 miles southeast of Schwerin, on the railway from Ludwigslust to Neubrandenburg. It is an ancient town, founded about 1200, and surrounded by walls in the ancient style, and contains many interesting buildings including its quaint Gothic townhall. It is perhaps best known as the birthplace of Field-Marshal von Moltke, to whom a monument was erected in 1876. Parchim is now a busy industrial town, manufacturing cloth, celluloid, etc., and is one of the richest cities of Mecklenburg, owning much of the surrounding land. Pop. 10,600.

PARCHMENT, a specially prepared animal skin used for several purposes. The ordinary method of treatment of the skin is as follows: It is first fleeced or depilated, then scraped, polished, treated with lime, then stretched and dried. Sometimes it is rubbed down with pumice-stone. Ordinary parchment is made from the skins of sheep, ewes or lambs; the skin of the ewe is more esteemed than that of the sheep, but the lamb-skin is preferred on account of its whiteness as well as being finer. That made from the skins of stillborn lambs is known as «virgin» parchment and closely imitates the quality of vellum. (See Vellum). For drumheads parchment made from calves or she-goats is usual, that of wolves is preferred; but for kettle-drums parchment of asses-skin is favored. Pigskin specially prepared as parchment is used for covering liturgical books and for sieves. One qualification needed is that the skin be thoroughly freed from grease. As to the origin of parchment, the invention is traditionally said to have been made through Eumenes II wishing to establish a library at Pergamos, but the importation of papyrus from Egypt was made difficult through his having differences with the latter country, so the invention was brought about to supply a substitute, about 190 B.C., and his celebrated library was made up of works written on the skins of goats. Thus the term parchment was probably derived from Pergamos, but the Persians and other Asiatic peoples had been using the skins of animals to write their records on long before this time. Greek authors speak of rolls, or royal *dipters,* of the Persians formed of strips of leather, and the Jews sent a copy of the Scriptures to Ptolemy transcribed on skins; the use is perpetuated by the Jews of copying their sacred books on tanned strips of skins. Pliny says that Cicero declared he saw the entire poem 'Iliad' written on this substance. The Romans termed parchment *charta pergamena.* With the perfection in the art of preparing parchment the most valuable books (*codices*) were made of this medium instead of the former papyrus rolls (*volumina*), though the use of the latter article (see PAPYRUS) remained in use for many years later, on account of its much smaller cost and the facility of procuring it. At the time of Pliny parchment was a dirty yellow tone as the process of whitening it was yet unknown; it was, however, already being tinted in purple to heighten the gold and silver lettering of sumptuous manuscripts. This staining, in the Christian era, was reserved for the sacred books and the usage has continued to modern days. Staining in black also was done for prayer-books. The most ancient manuscripts on parchment date back to the 3d century and the most ancient deeds are not anterior to the end of the 7th century. From that time on parchment displaced papyrus everywhere. From the 5th to the 15th century practically all manuscripts and, from the 8th century, most charters are written on parchment. And with the growth in favor and demand a true industry grew up in its production and workers became known as *pergaminarii.* But this increasing consumption brought also with it inadequate supply and the natural steady increase in price and, in order to economize, less important or antiquated documents were used over again after erasing or washing out the former inscriptions. These parchments utilized a second time are termed *palimpsests,* and, by the use of chemical reagents many extant pieces have had their earlier writing restored sufficiently to be deciphered. Saint Isidor of Seville writes that the first parchment-makers only knew how to make the yellow kind, but later the secret of bleaching was discovered in Rome. But, he says, as it soiled easily and fatigued the eyes besides, this discovery found little success. «Independently of the new secret,» he adds, «one distinguishes three sorts of parchment, the white, the yellow and the purple.» By the 13th century parchment was the principal substance used in writing in the European centres of learning. It was made in most of the abbeys, but in Paris was the great mart and great sales took place during the Lendit fair opening on the second week in June and held on the Saint Denis plain. At this great sale the university and its members, together with the royal «parcheminiers» had the privilege of first choice in selecting their share, after which the retailers were permitted to supply themselves. The preparation of parchment varied during the Middle Ages according to time and location; that used for manuscripts till the 10th century has generally a high polish and is very fine and white. Then the quality becomes irregular, being often rough, thick, poorly degreased and transparent. Paper was coming into use (see PAPER) and displacing parchment, and the discovery of the art of printing killed the slower process of calligraphy. By the 15th century we have donats, calendars, Bibles, the Fust and Schöffer Psalterium (1457) generally printed on parchment. Often these are evident imitations (decorative initials and all) made to deceive as written and not impressed in the much cheaper process, for parchment was too expensive in comparison with the now common paper. Parchment codices are generally made up in *gatherings* of four leaves (*quaterniones*) assembled in larger or smaller numbers to make up a book; the format varies also considerably. The roll (*volumen*) form was still used, however, in making up deeds, single sheets being sewn end to end, some to a great length. Parchment in recent years is in very reduced use, chiefly for wills and other deeds and for bookbinding and for drums and the friskets of the printers' press. See PAPYRUS; VELLUM; PAPER; MANUSCRIPTS, etc.

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CLEMENT W. COUMBE.

PARCHMENT, Vegetable, a substance first introduced in 1853. It is made by dipping ordinary unsized paper for a few seconds in concentrated sulphuric acid mixed with one-half its volume of water and then quickly removing all trace of the acid. The mixture is allowed to cool before being used. This simple treatment produces a remarkable change in the paper. It acquires a parchment-like texture; turns translucent, especially when thin; and becomes about five times stronger than ordinary paper. Vegetable parchment is also impervious to water, but is rendered soft and limp when dipped into it. A solution of chloride of zinc acts on paper in a similar way. In the manufacture of vegetable parchment a roll of paper is by a mechanical arrangement pulled through a vat containing the sulphuric acid (the time of immersion being from 5 to 10 seconds for thin paper), next through water, then through a weak solution of ammonia, and once more through water. It is afterward passed through felt-covered rollers, and then calendered. In recent years it has come into general use as a sanitary covering for bread, and other foods, both prepared and semi-prepared, candies, etc.

PARDEE, George Cooper, American physician and political leader: b. San Francisco, Cal., 25 July 1857. He was educated at the University of California, at the Cooper Medical College, and at the University of Leipzig, Germany. In 1885 he returned to California from abroad, began the practice of medicine as an eye and ear specialist, and was soon recognized as one of the leaders of his profession. He was also active in public life, was a member of the Oakland board of health and city council, and carried on a vigorous and successful campaign in behalf of pure water and against the licensing of poolroom gambling. In 1893 a reform movement in city politics was organized and he was elected mayor for two years; in this office he compelled the corporation owning the waterworks to reduce its high charges, and dealt with the railroad strike of 1894. In 1898 he was a candidate for the Republican nomination for governor, but was not nominated, and in 1900 was a delegate to the Republican National Convention. In 1899 he was appointed a regent of the University of California. In 1902 he obtained the Republican nomination for governor, and after a vigorous campaign was elected; the most important opposition to his election came from the labor element on account of his action during the strike of 1894. He served as governor until 1907. He was a member of the National Conservation Commission 1907–09, and was appointed chairman of the Conservation Commission of California in 1911. He was a delegate to the Progressive National Convention in 1912, and was a presidential elector in the same year.

PARDO, pär'dō, **Manuel,** Peruvian statesman: b. Lima, Peru, 12 Aug. 1834; d. there, 16 Nov. 1878. He was educated in Chile and in Europe, paying much attention to the study of law and political economy. For a time he was in government employ, then retired to private life, but in 1865 was appointed secretary of the treasury by President Prado, which office he filled with great ability. In 1869 he was elected mayor of Lima and in 1872 was elected to the presidency. His inauguration was opposed by Tomas Gutierrez, the minister of war under President Balta, who dissolved congress, imprisoned Balta and declared himself dictator. Pardo was compelled to flee, but when the dictator was killed in an uprising of the populace he returned and took the office 2 Aug. 1872, the first civilian President of Peru. His administration was one of great benefit to the country. He improved the financial condition of the country, aided the advancement of science and literature, crushed a rebellion in Moquegua and upon the expiration of his term of office in 1876 prepared to retire from public life, but was elected to the senate, of which body he was president when assassinated in 1878. His death was mourned as a national calamity.

PARDO-BAZÁN, pär'dō-bä-thän', **Emilia,** Spanish novelist and critic: b. La Coruña, Galicia, 1852. In 1891 she established and entirely wrote a critical review, ‹Nuevo Teatro Critico.› Her literary reputation in Spain was won by her works of fiction, generally classed as naturalistic, most satisfactory in picturesque delineations of Galician landscapes and manners. Among them are ‹Los pazos de Ulloa›; ‹La piedra angular›; ‹Pascual López›; the collection of short stories, ‹Cuentos de Marineda› — Marineda being La Coruña —; ‹Una Cristiana›; and its sequel, ‹La Prueba.› Among her critical writings is a prize essay, ‹Estudio de las Obras del Feijóo›; ‹San Francisco de Asis,› and ‹La revolución y la novela en Rusia.› The descriptive volumes, ‹Mi romeria› and ‹De mi tierra,› contain patriotic views of local scenes. She is the author of five plays.

PARDON, remission, by official act, of the penalty of crime; also the document granting such pardon. The custom dates from remote antiquity, and was usually exercised by the sovereign only. In England the king has sole power to pardon, but there are legal restrictions attached to its exercise. By power granted by the Constitution of the United States, the President may pardon all Federal offenses except impeachment.

Many reasons for giving this power to sovereigns and other chief executives have been assigned, among which may be mentioned the following: As a reward for actual reform of the criminal while in prison and for good conduct there, to mitigate the harshness of laws in their application to particular cases, the probability or possibility of the innocence of the accused person, for reasons of state, etc.

Offenses against the various States in this country are pardoned by official acts of such States, generally by the governors thereof. In some States pardons are granted by pardoning boards, and in others concurrence by the legislature is necessary.

The President of the United States may pardon before indictment or conviction, and his power to pardon, within constitutional limits, cannot be modified by legislation.

A pardon may be absolute or given on condition precedent or subsequent, and it may be merely a commutation of punishment. A condition precedent must be performed before the pardon takes effect, and a breach of a condition subsequent annuls the pardon, with the effect that the prisoner may be compelled to serve his full term, after a hearing before a court which decides whether he has violated the condition. Usually an absolute pardon effects a removal of all legal disabilities, but forfeited property or fines are never returned. A pardon secured through fraud or deception is void. Pardons are usually sought by means of petitions, together with affidavits and letters of persons stating the grounds upon which leniency is asked.

PARDOW, pär'dô, **William O'Brien,** American Jesuit priest: b. New York, 1847; d. 1909. In 1864 he was graduated at the College of Saint Francis Xavier, and subsequently studied at Woodstock College, Md., and in France. In 1891 he was president of the College of Saint Francis Xavier, New York; was provincial superior of the New York and Maryland province of his order in 1893; assistant at Saint Ignatius Loyola, New York, in 1901–03; lecturer at the Jesuit Institute in 1903–06; and assistant at the Gesu, Philadelphia, in 1906–09. He was a very eloquent preacher, by many considered the foremost of his time, and was also prominently identified with the Modernist movement.

PARÉ, pā-rā, **Ambroise,** French surgeon: b. Bourg Hersent, near Laval, department of Mayenne, 1517; d. Paris, 20 Dec. 1590. He studied in Paris and in 1536 attached himself as surgeon to the army destined to serve in Italy under Marshal René de Montejean. In 1542 he accompanied the Viscount de Rohan during his campaign at Perpignan. In 1552 he became surgeon to Henry II, under whose successors (Francis II, Charles IX and Henry III), he held the same post. His enemies were numerous among the physicians, who accused him of having poisoned Francis II. It was formerly believed that Peré was a Protestant, and that he was saved from the massacre of Saint Bartholomew by Charles IX, but M. P. Valet has proved that he was a Catholic. He introduced improvements in the treatment of gunshot wounds, in the operation of trepanning and in amputation. He also introduced or restored the practice of tying up divided arteries and operated on articular concretions. A noteworthy edition of his works was produced by Malgaigne in 1840–41. See the 'Life' by Paulmier (1884), and Paget, 'Ambroise Paré and his Times' (1897).

PAREGORIC (Greek, *παρηγορικός*, soothing) an opiate, the camphorated tincture of opium. It is composed of opium, benzoic acid, camphor, oil of anise, honey and dilute alcohol. Every fluid ounce contains two grains each of the opium, acid and camphor and two minims of oil of anise. It is an anodyne and antispasmodic and is much used to allay cough, relieve pain in the stomach and intestines, and to induce sleep. Many parents rely on this preparation to quiet young children and relieve pain in the stomach; but great harm results from too frequent doses because of the susceptibility of young children to opium. Though a comparatively weak preparation of opium, if given repeatedly or in a large dose it may act as a poison.

PAREIASAURUS, or **PARIASAURUS,** a genus of extinct reptiles. See THEROMORPHA.

PAREJA, Juan de, hoo-än' dā pä-rā'hä, familiarly called "El Esclavo," Spanish painter: b. Seville, 1606; d. Madrid, 1670. He had, while a mere boy, been purchased by the painter Velasquez as a slave and was of Moorish parentage. Constantly employed in the painting-room of Velasquez, whom he had accompanied to Madrid in 1623, he became inspired with a passion for painting and secretly copied the works of his master whom he accompanied to Italy, taking every opportunity of perfecting himself in his art. As Philip IV was in the habit of visiting the studio of Velasquez and turning every picture the face of which was to the wall, he one day turned a picture which Pareja had completed with great care and placed in the king's way. When the king asked who the painter of the work was, Pareja fell on his knees and asked Philip to protect him. "Such a painter as that," replied the monarch as he turned to Velasquez, "ought not to be a slave." Velasquez gave the newly found artist a deed of manumission and took him to be his pupil. A fine portrait of Paraja by Velasquez is shown in the collection of the Earl of Radnor. Pareja's 'Calling of Saint Matthew' (1661) is in the Prado Gallery at Madrid, and in the Hermitage at Saint Petersburg is a very beautiful portrait by him. In the chapel of the Recollects at Madrid is his 'Saint John the Evangelist, Orontius and the Madonna'; and the 'Baptist, of Christ' is in the Santa Trinidad at Toledo. These pictures exhibit him not only as a learned and skilful disciple of his master, Velasquez, but as very much of a genius in his own way who has much of the style of the best schools of Genoa and Venice in his work, which shows, at times, a strong reflection of the Flemish masters. While his early work was purely imitative, he became later in life as cosmopolitan as his master, with whom he traveled constantly and thus had a chance to study the best in art. His conception and coloring are little inferior to those of Velasquez.

PARELLA, a name given to some of those crustaceous lichens of commercial value which are used to produce archil, cudbear and litmus. The name more strictly belongs to one species, *Lecanora parella,* and the red or crimson dye prepared from it. See ARCHIL.

PARENCHYMA, *in anatomy, zoology* and *botany,* the soft tissue of organs: in anatomy it signifies the true tissue as distinct from connective tissue; in zoology it is generally applied to that of open tissue, as of the lungs and liver; in botany to the substance of leaves, as the green "palisade-parenchyma" of the upper surface of a leaf, or the "spongy parenchyma" of the lower surface. The characteristic feature of parenchyma of plants is that the cellular tissue is shallower and encloses intercellular spaces; whereas in prosenchyma it is deeper and without cellular interspaces. See TISSUE; LEAVES.

PARENT, pạ'rän', **Etienne,** Canadian journalist and cabinet officer: b. Beauport, near Quebec, 2 May 1801; d. Ottawa, 23 Dec. 1874. He was educated at the Seminary of Quebec and at the College of Nicolet. At 21 he became editor of *Le Canadien,* an old and influential journal published in French, which position he resigned in 1825 in order to study law. He was called to the bar in 1828, but practised for only a brief period, becoming translator, and subsequently librarian, of the legislative Assembly of Lower Canada. He again edited *Le Canadien* in 1831–42, suffering imprisonment in 1837–38 because of political opinions published in his newspaper. Upon the union of Upper and Lower Canada into one province in 1841, Parent was elected to its assembly from Saguenay; but in 1842 he resigned in order to accept an appointment as clerk of the executive council. In 1847–67 he was assistant secretary for Lower Canada, and in 1867 he was appointed Acting Assistant Secretary of State for Canada. Throughout his career he continued to write for *Le Canadien,* bringing effective support to the French-Canadian party. He was deeply interested in the improvement of industrial conditions and an advocate of political and religious reforms. He was a lecturer of repute and did much to popularize that form of instruction in Canada. Author of 'Du travail chez l'homme,' 'L'Industrie comme moyen de conserver notre nationalite,' and 'Importance de l'étude de l'économie politique,' published in 'Repertoire Nationale' (1848); 'De l'importance et des devoirs du commerce' (1852); 'Considerations sur le sort des classes ouvrières' (1852), etc.

PARENT, Simon Napoleon, Canadian statesman: b. Beaufort, Province of Quebec, 12 Sept. 1855. He was graduated at Laval University in 1881 and was called to the bar in that year. He engaged in practice in Quebec, attaining eminence in his profession. He served on the municipal council of Quebec in 1890–94, and was mayor of that city in 1894–1906. In 1890–1905 he represented Saint-Sauveur in the legislative assembly of Quebec; was Minister of Lands, Forests and Fisheries in 1897–1900, and from 1900 until he retired from public life in 1905 he was Prime Minister of Quebec. He became chairman of the Transcontinental Railway of Canada in 1905.

PARENT AND CHILD. See LAW OF FAMILY.

PARENT-TEACHER ASSOCIATIONS. Associations of parents and teachers came into being as a co-operative agency between the parents and the public school. The need for such associations is due to parental ignorance of educational procedure; to parental indulgence of childhood weaknesses to the injury of the children; to the teachers' ignorance of child development; and to the lack of authority by school officials to compel obedience. By a common association the attention is focussed on the child and his educational problems. The parent becomes acquainted with the difficulties besetting the teacher by seeing the school activities and by following his child into his place in the school organization. In so far as the parent can comprehend, he is made to see the educational process applied to his child and his sympathetic interest is elicited. The teacher learns the mental and moral characteristics of the parental antecedents of the child and makes contact with the home atmosphere. The teacher by getting a sympathetic understanding of the child's homelife, gets a clearer knowledge of the child's mental habits and capacities. The clearer point of view by both parent and teacher sheds light on problems of school discipline and removes obstacles in the child's relations to school authorities.

A parent-teacher association usually consists of all the parents who send their children to the same public school building, and all the teachers who teach in that building. An association may be formed of all the parents and teachers of an entire community. If the community is large, with more than three school buildings, building associations give better results than community associations. A central association composed of the building associations is sometimes found profitable. The organization is simple, needing no more officers than are necessary to conduct meetings, arrange programs, receive and expend small sums of money. Since education is the fundamental purpose it is necessary that the principal or superintendent be the guiding spirit of the association. When the parents become the leading element in the association, the purposes of the association will frequently become social or even political to the neglect of the child's educational interests.

The activities of parent-teacher associations start properly and effectively with exhibitions of school work to which the parents are invited. From the school exhibit the parents enter intelligently into the school's problems. Methods of teaching particular subjects may be presented. Special activities such as playgrounds or community dances may be explained. Important phases of child life may be presented. Many parents as well as children are poorly acquainted with the difficult period of adolescence. Vocational guidance can be made clear to parents and children. Home study, an ever-vexatious question, may be adjusted. Home social diversions may be restricted and guided. A school library may be started or augmented by the association. School equipment may be improved by laying right foundations in parental intelligence and interest. New schoolhouses mav be secured. Right sanitation may be established. All the legitimate interests of the child and the school are promoted by a right use of a parent-teacher association.

The education of the American parent is an important part of our educational problem. The immigrant parent is our chief concern but by no means our only concern. Parents often lose control of their children because they cannot intelligently follow the studies of their children in school. The child who finds that his excursions into algebra of Latin or biology carry him beyond the range of his parents' achievements may lose respect for his parents. Membership in a school social organization may set up a false sense of importance and independence in the child. The child's ambitions may reach out beyond the limits of the parents' vision. How to educate the parent up to the child is no mean question. How to help the father and mother understand the first three of the seven "ages of man" is a large undertaking. The parent-teacher association offers an organized scheme for this education of the parent and will show much common ground between parent and teacher. It will help the parent better to know his own child. See EDUCATION, ELEMENTARY.

A. R. BRUBACHER,
President of New York State College for Teachers.

PAREPA-ROSA, pā-rā'pā-rō'sā, **Euphrosyne Parepa de Boyesku,** British opera singer: b. Edinburgh, Scotland, 7 May 1836; d. London, England, 21 Jan. 1874. She was the daughter of Georgiades de Boyesku, a Wallachian nobleman, and was educated by her mother. In 1855, she made a successful début at Malta where she appeared under the stage name of Parepa, and in England the following year. She possessed a soprano voice of remarkable power, and sang in the title-rôles of 'Camille,' 'La Reine Topaz,' 'Victorine' and other operas, with great success. She was married in 1864 to an English army officer, Henry de Wolfe Carvel, who died the next year. In 1866 she made her first tour of America and in 1867 was married to Carl Rosa, a noted violinist, operatic manager and conductor with whom she formed the Parepa-Rosa Company. Her success continued unbroken until her death, which occurred while she was preparing her part in an English version of 'Lohengrin.' She excelled in oratorio.

PARESIS. See GENERAL PARESIS; INSANITY.

PARHELION, *in astronomy,* a mock sun, having the appearance of the sun itself, and seen by the side of that luminary. Parhelia are sometimes double, sometimes triple and sometimes more numerous. They appear at the same height above the horizon as the true sun, and they are always connected with one another by a white circle known as the parhelic circle. This circle is due to the reflection of the sun's rays by the vertical faces of ice-crystals in the air, which assume a definite orientation in falling. The parhelia appear where the parhelic circle crosses and reinforces the two halo circles around the sun at distance of 22° and 46° respectively. The halos show the colors of the rainbow with the red inside. They are due to the fact that 22° and 46° are approximately the angles of least dispersion, and hence of the greatest transmission of light, for ice prisms with angles of 60° and 90° respectively. Very rarely parhelion-like concentrations of the parhelic circle are observed at 180° or 120° from the sun. These are known as anthelia or paranthelia, respectively. See HALO.

PARIA, pä'rē-ä or pä-rē-ä', (1) gulf of the Atlantic between Trinidad and Venezuela and almost hemmed in by land, being connected with the ocean by the Boca de Dragos or Dragon's Mouth, at the north, and by the Boca del Soldado or Soldier's Mouth, at the south. These straits are about 10 miles wide, are very dangerous and were first sailed through and named by Columbus in 1498. The gulf (sometimes called Golfo Triste) furnishes good anchorage. It measures 100 miles in length and 40 in width, receives the northern waters of the Orinoco as well as the Colorado, and is full of fish. (2) A peninsula, jutting to the east from the mainland and forming the northern side of the Gulf of Paria. It is formed by a bold picturesque ridge of mountains. (3) The extreme eastern point of this peninsula is called the Cape of Paria (or Punta Panas).

PARIAH, pä'rĭ-ą, a low class of Hindus in the Tamil country in Madras. They belong to the class of agricultural laborers and are commonly employed as servants by Europeans. They are avoided as unclean by all castes professing Brahmanism, yet are superior to some other castes in the Tamil country. The name is derived from *parai*, a large drum, the Paraiyans being the hereditary drumbeaters at festivals and similar occasions. The caste numbers nearly two and a half millions. It corresponds to the Malas in the Telegu country. The Holeyas in the Kanarese country and the Mahars in the Deccan. They performed notable service under Clive, their numbers furnishing a large proportion of the sepoys, and many of them are in the Madras Miners and Sappers branch of the service. Many of them have distinguished themselves by ability after being educated, their intelligence being decidedly normal. The word has come into common use in English as descriptive of any class degraded socially. Consult Lapique, L., Le problème anthropologique des Parias et des caste homologues, chez les Dravidiens' in 'Bulletin de la Société d'Anthropologie de Paris' (Vol. VI, 1905).

PARIAH DOG, one of those dogs which are masterless and run wild in many Oriental cities. The name is derived from that given to the outcast or lowest servant class in India where, as also in Constantinople and other cities, such dogs are extremely numerous. In many cities they form almost a distinct breed, being of large size and generally of a dirty yellow or blackish color. The hair is short and smooth, and the ears pointed and erect. They possess the canine instinct of running in packs and frequently take possession of certain districts after nightfall. A very useful service is performed by them in Constantinople, where they act as scavengers and devour the garbage which is not otherwise removed. Their wits have been sharpened by this precarious mode of life and they are said to be possessed of unusual intelligence and cunning. By the Mohammedans they are considered unclean and the faithful are defiled by accidental contact with one of them. Pariah dogs fall into five classes, namely, (1) A wild breek of a reddish-brown color inhabiting the lower ranges and jungles of the Himalayas; (2) those inhabiting districts in which turnspits are frequently met with; (3) those of Sumatra which are distinguished by their fox-like appearance and their bushy pendulous tail; (4) the indigenous Javanese animal. (5) To these should be added the Egyptian dog already mentioned, which seems to be in many ways distinct from the other four classes.

PARIAN CHRONICLE. See ARUNDEL MARBLES.

PARIAN MARBLE, the most celebrated statuary marble of antiquity. It is white, of mellow tone, and large-grained. It received its name from the island of Paros (q.v.), where it was quarried. See MARBLE.

PARIMA, pä-re'mą, **Sierra de Sierra,** mountain range of Guiana, Venezuela and Brazil. The eastern end of the range is known locally as the Sierra Pacaraima. This range of mountain forms an extensive, irregular upland plateau sloping toward the valley of the Amazon and to the right and left of it. The Orinoco flows on three sides of the range, which has as its southwestern boundary the Rio Negro and reaches east to the Essequibo. A bare plateau it is with old sandstone superficial strata and a granite core. The range reaches its highest points in Sierra Maraguaca, Duida and Yamari, which are over 7,000 (the first two over 8,000) feet high. The roughest and most defined part of the Parima range is that which extends into Venezuela.

PARINI, Giuseppe, joo-sĕp'pĕ pä-rē'nē, Italian poet: b. Bosisio, a village of the Milanese, 23 May 1729; d. Milan, 15 Aug. 1799. He studied theology and was ordained a priest in 1754. His interests were always literary, rather than ecclesiastical. He was an instructor successively in the Scuole Palatine and the Brera College, at Milan, and held office for three years in the city government under Napoleon. His chief work is 'Il Giorno' ('The Day'), a biting satire on the Italian nobility. He wrote also some excellent odes, and was always most skilful in the arts of versification. There is an edition of the 'Giorno' by Borgognoni (1892). Consult Dumas, 'Parini, Sa Vie ses Oeuvres son Temps' (1878); Cantu, 'L'Abate Parini' (1891); Cerquetti, 'Il testo piú sicuro delle Odi di Giuseppe Parini' (Osimo 1892).

PARIS, or ALEXANDER, was the second son of Priam, king of Troy and Hecuba, and is set forth in Homer as the cause of the Trojan War. Before his birth his mother dreamed that she had brought forth a fire-brand, which reduced Ilion to ashes, and Priam, learning this, gave her next son to be exposed by a shepherd on Mount Ida. Here the babe was suckled by a she-bear and the shepherd discovering this after five days, gave him the name of Paris, and undertook his rearing. The name of Alexander was given him later for his valiant defense of certain heroes. On Mount Ida he fell in love with the nymph Œnone, daughter of a river god. Their happiness was interrupted one day by the appearance of Hermes leading before Paris the three goddesses Hera, Athene and Aphrodite. At the bridal of Peleus and Thetis, Eris, or Ate, goddess of strife or mischief, had thrown down a golden apple on which was inscribed «to the fairest woman.» Hermes called upon Paris to decide which of the three goddesses present was entitled to the gift, for each of the three claimed it as hers by right. Hera promised to the beautiful shepherd power and dominion if he would decide in her favor; Athene offered fame and wisdom; Aphrodite pledged herself to send him the loveliest wife in the world. The judgment of Paris was made in favor of the goddess of love, and when he one day brought a bullock for sacrifice at a festival in the city of Troy, he was recognized by his sister, Cassandra, the prophetess, and acknowledged by Priam as his son. With the aid of Aphrodite he carried off Helen, the beauteous wife of Menelaus, king of Lacedæmon, and returned with her to Troy. This was the cause of the Trojan War, for Agamemnon joined his brother Menelaus in a campaign in which Troy was besieged for 10 years and eventually sacked. Homer has given us vivid ideas of the beauty of Paris and has described him as fond of minstrels and of beautiful women, as well as skilful in war. His lightness of character is also dwelt upon by the poet. After the fall of Troy, he returned to Mount Ida and the nymph Œnone to be healed of the wound he had received from the arrow of Hercules shot from the bow of Philoctetes. But Œnone repulsed her faithless lover, who died of his wound. In Greek art he is represented as a beardless young man of handsome form, wearing a Phrygian cap, and generally seated with the apple in his hand as in the statue bv Euphranor in the Vatican. The Judgment of Paris is the subject of vase paintings. See Iliad; Homer; Trojan War.

PARIS, pă-rês, **Gaston Bruno Paulin,** French philologist: b. Avenay (Marne), 9 Aug. 1839; d. Cannes, 6 March 1903. He was son of a noted father Paulin Paris (q.v.). In 1872 he became professor of French language and literature at the Collège de France, succeeding his father, and in 1895 director of that institution. In 1896 he was elected to the academy. A pupil at Bonn of Diez, he did much to carry forward the study of Romance philology which the former had practically founded. He and Paul Meyer founded *Romania*, a romance journal. He was one of the greatest of French critics and a very profound and able philologist. His knowledge was wide as his preparation had been deep. He devoted himself principally to the language and literature of his own country, and he used all his efforts to arouse in his pupils a love and appreciation of the best in literature. ‘A Poetical History of Charlemagne’ (1866); ‘Poetry of the Middle Ages’ (1885); and ‘French Mediæval Literature’ (1888), are his most important publications.

PARIS, pă-rĕ, **Louis Albert Philippe D'Orléans,** Comte de, French nobleman, grandson of Louis-Philippe: b. Paris, 24 Aug. 1838; d. Stowe House, Buckinghamshire, England, 8 Sept. 1894. His father was killed by an accident in 1842, leaving him heir to the French throne. After the revolution of 1848 he resided for a time at Claremont Park, Surrey, where he was educated by his mother, and where Louis-Philippe died in 1850. He made a journey to Syria in 1859 in company with his brother, the Duc de Chartres, and on his return to England he published an account of the journey under the title of ‘Damas et le Libeau.’ In 1861, during the American Civil War, he, with his brother, the Duc de Chartres, served as volunteers in the Union army in order to gain a practical knowledge of military affairs, and were for some time on the staff of General McClellan. On his return to Europe in 1862 he married his cousin, the Princess Marie-Isabelle, eldest daughter of the Duc de Montpensier. Under a nom de plume he began about this time to contribute to the *Revue des deux Mondes*. On the outbreak of the Franco-German War he desired to serve against the enemies of France, but was not allowed by the French authorities to do so. After the war, however, he was admitted a member of the first national assembly, and his property was restored to him. On the death of the Comte de Chambord, in 1883, the Comte de Paris was recognized as head of the royal house of France. Under the expulsion bill of 1886 — a measure due to the fear of the French republicans that the royalist party was becoming too strong — he, and the other royal princes, were forbidden to reside in or enter France. The same year his eldest daughter was married to the crown-prince of Portugal. He published a valued ‘Histoire de la Guerre Civile en Amérique (1874–75), which has appeared in an English translation; and ‘De la Situation des Ouvriers en Angleterre’ (1864). During his latter years he lived the retired life of an English nobleman.

PARIS, păr'ĭs, **Matthew,** English mediæval historian: b. about 1200; d. about 1259. He entered the Benedictine order at the monastery of Saint Alban's in 1217, and on the death of Roger of Wendover in 1236 succeeded to the post of historiographer and began the continuation of the ‘Chronica Majora,’ a record of English history kept at the monastery. In 1246 he was invited by Hacon IV of Norway to adjust the affairs of the abbey of Saint Benet Holm in Trondhjem province, and in 1248–49 thoroughly reorganized the establishment and received extensive gifts from the monarch. His great chronicle ends abruptly at May 1259. He carefully revised the work of the early compilers on the ‘Chronica,’ extending to the end of 1188, and the contribution of Wendover (1189–1235) and prepared an abridgment called the ‘Historia Minor’ (1067–1253). His narrative is extremely accurate; he wrote brightly and with vigor, noted important happenings of foreign lands, and did not spare his censure when he thought it needed. Paris also prepared an abridgment of the ‘Chronica Majora’ covering the period 1067–1253 which contains a few incidents not recorded in the larger work; and he wrote the ‘Vitæ Abbatum S. Albani.’ Consult Gross, C., ‘Sources and Literature of English History’ (London 1900); Jessopp, A., ‘Studies of a Recluse’ (London 1893); Plehn, Hans, ‘Politische Character Matheus Parisiensis’ (Leipzig 1897); Potthast, A., ‘Bibliotica Historica Medii Ævi’ (Vol. II, Berlin 1896).

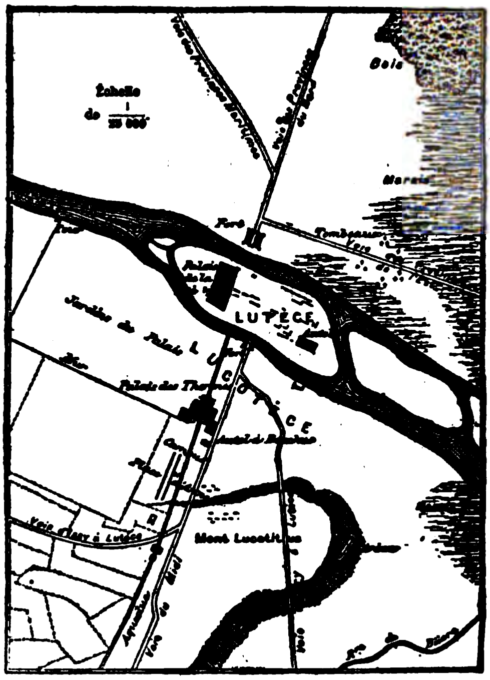
PARIS, Paulin, French philologist and historian: b. Avenay, Marne, 1800; d. Paris, 1881. He became an assistant in the manuscript department of the National Library, and an expert in the decipherment of old French literature, his work marked by ceaseless energy, good taste and a pleasing style, extending over 50 years. He was elected a member of the Academy of Inscriptions in 1837 and from 1853–72 was professor of mediæval history in the Collège de France, where he was succeeded on his retirement by his eminent son Gaston Paris (q.v.). His principal works are the catalogue of 'Manuscrits français de la bibliothèque du roi' (1836–48); and his edition of the 'Grandes chroniques de France' (1836–40). Among his numerous other works are notable selections from manuscripts, 'Romancero français,' 'Garin le Loherain,' 'Berte aus grans piés,' 'Romans de la table ronde' and a French translation of Byron (1830–36).

PARIS, păr'ĭs (Fr. pä-rē), the capital and chief city of France, and the political, literary, artistic and social capital of Europe since the decline of Rome, situated in the northern part of France, on both banks of the Seine, in lat. 48° 50′ N. and long. 0° 00′ Observatoire. It is the second city in size in Europe, and the third centre of population on the earth, being surpassed only by New York and London. The population, according to the census of 1911, is as follows: Paris, within the walls, 2,888,110; the Northern and Southern suburbs, 1,265,932; total for Greater Paris, 4,154,042. This is the department of the Seine, with an area of about 184 square miles. To this should be added half the population of the department of Seine et Oise, 458,808, which gives a grand total of 4,562,850 for Paris and the suburbs. It is the only considerable modern city which is completely surrounded by a wall, and the population, in consequence of the confined area within the fortifications (about 31 square miles), is the densest in Europe. The following table gives the population at various times since the early part of the 13th century, before which no accurate census is found:

In 1220, under Philippe Auguste	120,000
In 1250, under Louis IX	130,000
In 1380, under Charles V	150,000
In 1605, under Henry IV	200,000
In 1715, under Louis XIV	500,000
In 1810, under Napoleon	600,000
In 1831, under Louis Philippe	786,000
In 1851, under the Second Republic	1,053,000
In 1861, after the annexation of the faubourgs within the fortifications	1,696,000
In 1866, under Napoleon III	1,825,000
In 1876	1,988,800
In 1886	2,344,000

For a thousand years prior to about the middle of the last century Paris was the largest city in the world. The defense of this metropolis is provided for by an elaborate system of fortifications, which were constructed between 1840 and 1845, at an expense of 140,000,000 francs. The enceinte, with its 94 bastions, is about 22 miles in length. The ramparts, averaging 32 feet in height, with a parapet 19 feet in width, are environed by a moat 48 feet in width, and a glacis. The approaches to the city are also commanded by 17 detached forts at different but relatively short distances from the walls. A second line of forts at a greater distance from the ramparts has also been constructed on the heights commanding the valley of the Seine. The area included within this elaborate system of fortifications is 400 square miles. The garrison in time of peace numbers 50,000 men. Thus Paris is the greatest fortified camp in the world. But the experience of the late war has shown that fortifications, even the most elaborate, are of little value against modern artillery; the only real defense for the great city is the army. The administration of the city is shared between the Prefect of the Seine, appointed by the Minister of the Interior, and the municipal council elected for a term of three years — one from each *quartier* — by universal suffrage. The annual budget runs to 375 or 400 millions of francs. The city is divided into 20 arrondissements, in each of which there is a mayor and a mairie, which is the office of the mayor, and constitutes a sort of city-hall for the arrondissement. Each of the arrondissements is divided into *quartiers* corresponding roughly to the wards of an American city. With 20 arrondissements there are 80 of these *quartiers*, each one of which has a distinguishing name, as for example, the quarter of the Champs Elysées in the eighth arrondissement, or the quarter of the Sorbonne in the fifth arrondissement. These quarters are in general of about the same territorial extent, but the population varies greatly between about 10,000 and 110,000.

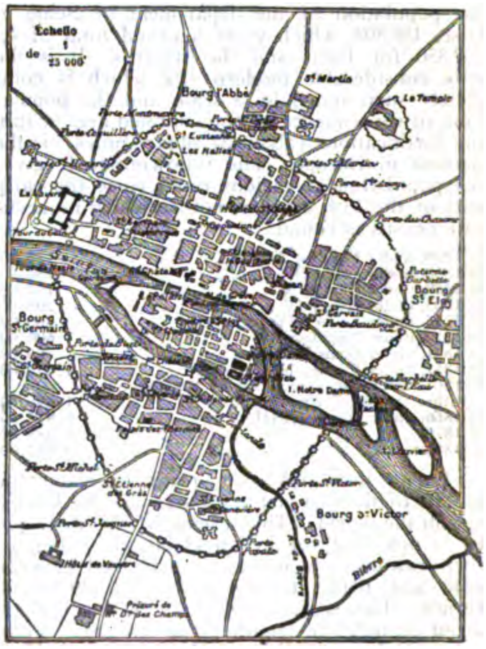
Early History.— Our knowledge of Paris and its people begins during the Roman invasion of Gaul, in the spring of the year 53 B.C., at which time Julius Cæsar convoked at Lutetia an assembly of the Gallic tribes. This is the first mention of what is now Paris in authentic history. Its annals thus commence in the 'Commentaries' of Cæsar, wherein, referring to that assembly, he mentions a collection of fishermen's huts on the island in the Seine, which he calls Lutetia — probably and perhaps certainly a Latinized form of the name by which it was then locally known. Strabo writes it *Lucotocia*, and Ptolemy *Lucotecia*, while the Emperor Julian dates a letter from the city calling it *Loukhetia*. Of these various spellings, that employed by Cæsar is the one commonly adopted, although the hill of the university was known for many centuries as "*Mons Lucotitius*." In modern French it is written *Lutèce*, and is understood to refer only to the island of the city, while *Lucotèce* is the French name for the Roman settlement on the left bank. The derivation of the word has been the subject of much research. Scholars have attempted to trace it to Celtic sources, especially to the dialect of lower Brittany. Cæsar in the 'Commentaries' states that the inhabitants of the island in the Seine to which he refers formed a division of a clan or tribe, called the *Parisii*. Thus, he says, "The *Parisii* are inhabitants of a tract bordering upon that of the Senones, with whom tradition says they were once allied." In the year 52 B.C., Labienus, the lieutenant of Cæsar, marched upon Lutetia, and after a battle fought with the Parisii in the plain now covered by the southern suburbs, and of which an echo remains to this day in the name of the little village of Vitry (place of the victory) took formal possession of the island on behalf of the Romans. The etymology of the term *Parisii* has been no less a subject of dispute than that of Lutetia. It is, however, also traced to lower Brittany and to a Celtic word signifying a boat. The ancient, as well as the modern, emblem of Paris is a boat, as may be seen by the interesting carving which ornaments the base of one of the vaults of the roof in the Palais des Thermes. Thus the figure of a ship which serves everywhere to identify the property of the city of Paris to-day, and which constitutes the hallmark, so to speak, of the city, harks back to the *Parisii* of Cæsar and his 'Commentaries.' Hilaire Belloc says, «The triple prows which are seen on the lamp-posts of modern Paris are an emblem 1,500 years old, and without a break of continuity.» The Romans occupied Paris for more than 500 years. Extensive remains of their domination are still found on the left bank, notably the Palais des Thermes at the Musée de Cluny, the amphitheatre, just out of the rue Monge, the arches of the aqueduct which crosses the valley of the Bièvre at Arcueil — two of the arcades of which are preserved to this day, just outside the southern wall — and the ruins of the reservoir connected with it which were discovered in opening the rue Gay-Lussac.



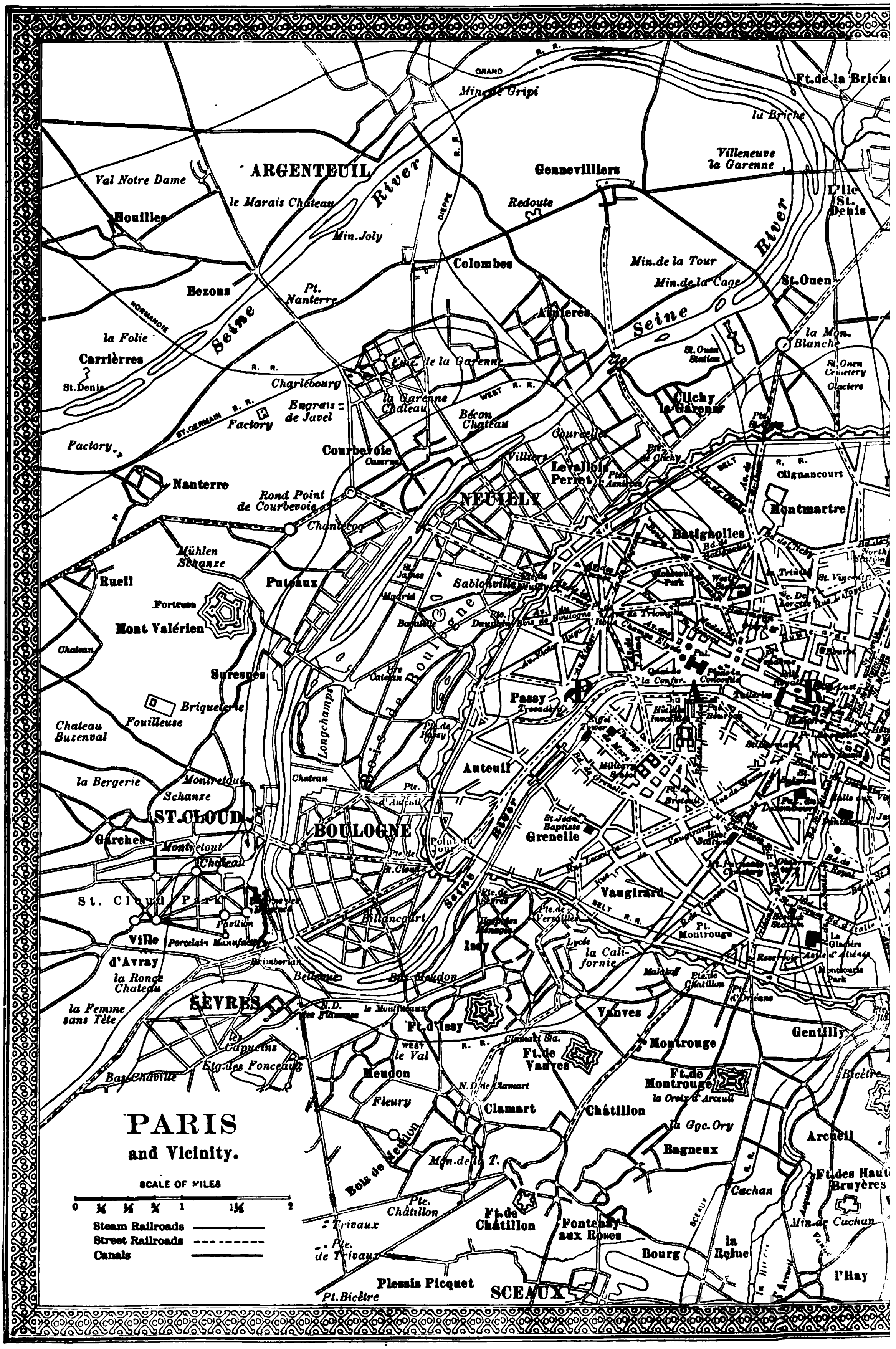
Paris under the Romans.

Topography.— A modern traveler looking over the town from the heights of Montmartre, from the top of the Eiffel Tower or from the dome of the Pantheon, sees the city spread out before him like a map, lying in a plain encircled on almost every side by distant and low hills, those on the north and east being farther removed than those on the south and west. Paris, therefore, is situated in what geologists call a basin or plain of greater extent than that occupied by any other modern capital, being scarcely ever less than 20 miles in diameter and in some places much more. The Seine enters this plain at the southeast corner, coming from the highlands of Burgundy and Champagne, and, describing a great arch or bow through the city, passes off and out at the southwestern corner of the plain.

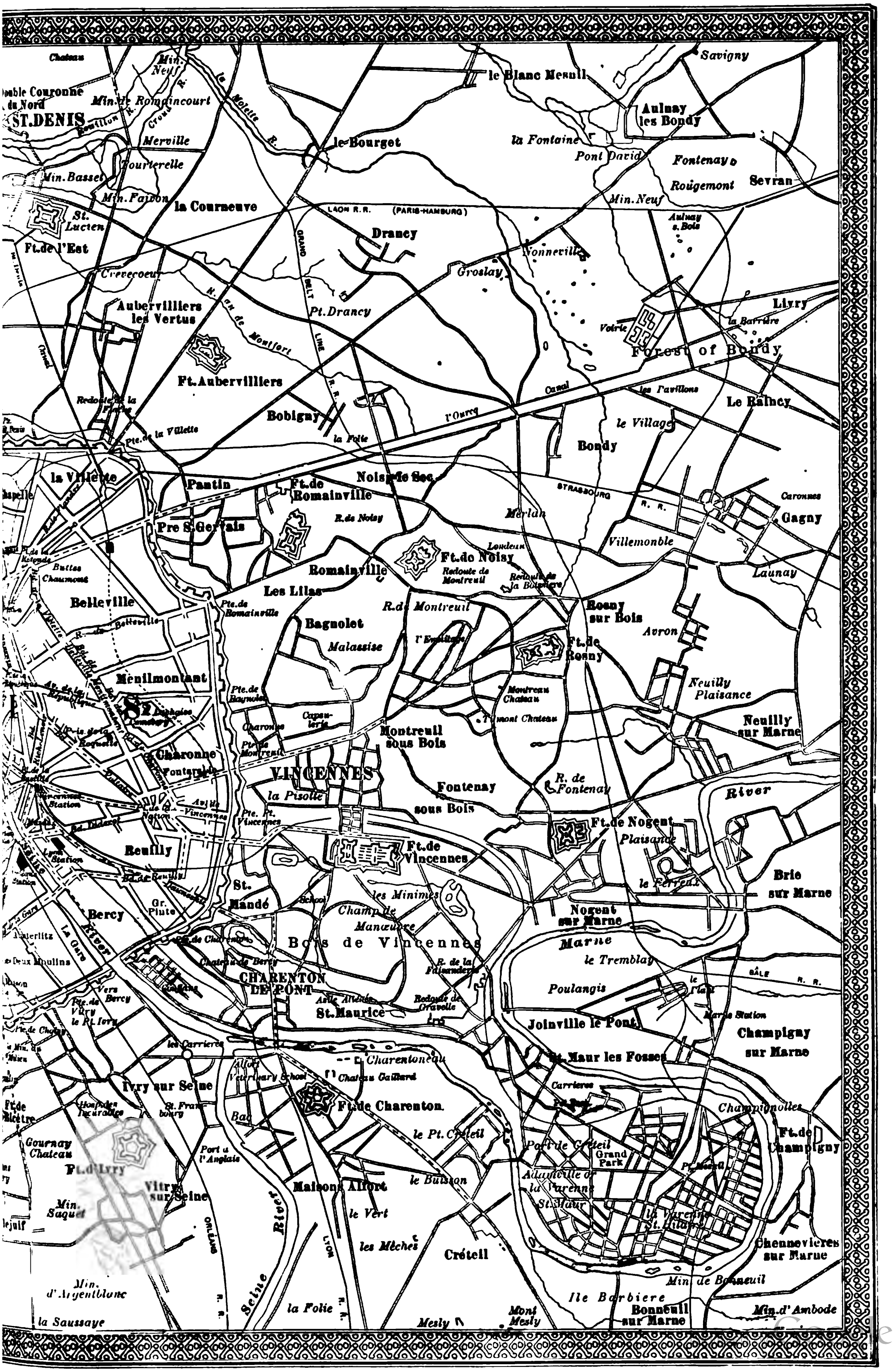
On the west rises Mont Valérien, and on the north the hillocks of Enghien and Montmorency; the hill of the university or Mont Sainte Geneviève on the one hand, and the somewhat more conspicuous eminence of Montmartre on the other rising out of the plain. Paris naturally divides itself into the Cité, the University, or the left bank, and the Ville, or the right bank, and to be understood it must be looked at from these three points of view. Originally the town was all on the island, but even in the days of the Romans villas and country seats were built on either bank, especially on the north bank up toward the heights of Montmartre, while on the south bank the Romans fixed their camp and at the same time the emperor's palace. We note that Julian the Apostate, who resided much of the time at Lutetia — which began about this time to be called Paris — was crowned emperor of Rome in the year 361 A.D., at a spot in the camp on the left bank, which is now located in or near the boulevard Saint Michel, between the boulevard Saint German and the Luxembourg. Julian was very fond of Paris, referring to it in one of his letters as «*ma chère Lutèce*» (so writes with charming näveté an ancient chronicler of the town), and praising it for its vineyards, its mild climate, the figs and the white grapes (which we still have) that the farmers of the suburbs furnished for his table, saying that Bacchus is the god of the Parisians because he is the father of joy. By the time of Philippe Auguste the city had extended on the right bank as far down the river as to what is now the eastern façade of the Louvre, the foundation stones of which were laid by that monarch in the year 1223. The wall of Philippe Auguste extended from his palace of the Louvre in a wide loop northward and eastward to a point about the middle



Paris under Philippe Auguste.

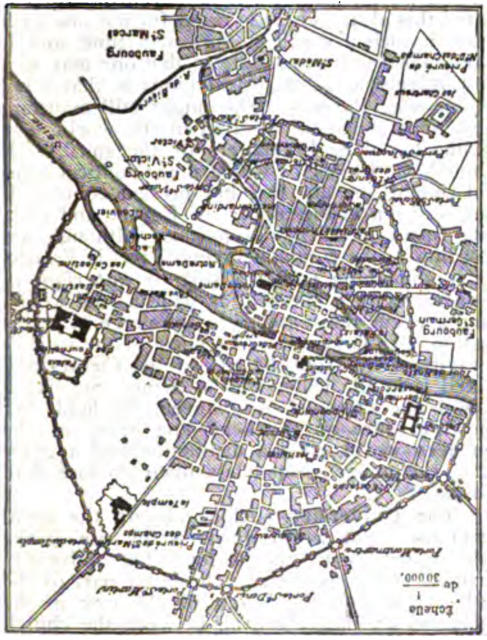


PARIS
and Vicinity.


Chateau
Min. Neuf
le Blanc Mesnil
Savigny
Double Couronne du Nord
Min. de Romaincourt
St. DENIS
Rouillon R.
Croud R.
le Molette R.
Aulnay les Bondy
Merville
le Bourget
la Fontaine
Pont David
Fontenay
Tourterelle
Rougemont
Sevran
Min. Basset
Min. Faiton
la Courneuve
Min. Neuf
LAON R. R.
(PARIS-HAMBURG)
St. Lucien
Drancy
Aulnay s. Bois
Ft. de l'Est
GRAND BELT LINE R. R.
Nonneville
Crevecoeur
Groslay
Aubervilliers les Vertus
Pt. Drancy
Livry
R. de Montfort
Canal
Voirie
la Barriere
Forest of Bondy
Ft. Aubervilliers
Canal
les Pavillons
Le Raincy
Redoute de la Flache
Bobigny
l'Ourcq
le Village
Pte. de la Villette
la Folie
Bondy
la Villette
Pantin
Noisy le Sec
Ft. de Romainville
STRASBOURG R. R.
Caronnes
Chapelle
Merlan
Gagny
Pre S. Gervais
R. de Noisy
Butte Chaumont
Londeau
Villemonble
Ft. de Noisy
Redoute de Montreuil
Redoute de la Boissiere
Launay
Romainville
Belleville
Les Lilas
Pte. de Romainville
R. de Montreuil
Rosny sur Bois
R. de Belleville
Bagnolet
l'Ermitage
Avron
Malassise
Ft. de Rosny
Ménilmontant
Av. de la République
Pte. de Bagnolet
Montreau Chateau
Neuilly Plaisance
Charonne
Capsuleri
Tremont Chateau
Neuilly sur Marne
Pte. de Montreuil
Montreuil sous Bois
Charonne
Fontarabie
VINCENNES
R. de Fontenay
la Pisotte
Fontenay sous Bois
River
Pl. de la Nation
Pte. Vincennes
Ft. de Nogent
Plaisance
Reuilly
Ft. de Vincennes
Lyon Station
Bd. Diderot
St. Mandé
le Perreux
Brie sur Marne
les Minimes
Gr. Piute
School
Bercy
Champ de Manœuvre
Nogent sur Marne
River
Bois de Vincennes
Marne
Austerlitz
Pte. de Charenton
le Tremblay
Deux Moulins
Chateau de Bercy
R. de la Faisanderie
BALE R. R.
Vera Bercy
CHARENTON DE PONT
Poulangis
le Plant
Pte. de Vitry
Asile Aliénés
Redoute de Gravelle
St. Maurice
Marne Station
le Pt. Ivry
Joinville le Pont
Champigny sur Marne
les Carrieres
Charentoneau
St. Maur les Fosses
Alfort Veterinary School
Chateau Gaillard
Ivry sur Seine
Carrieres
Ft. de Bicêtre
St. Frambourg
Ft. de Charenton
Champignolles
Hospice des Incurables
le Pt. Creteil
Ft. de Champigny
Gournay Chateau
Port de Creteil
Grand Park
Port a l'Anglais
Ft. d'Ivry
Adamville or la Varenne St. Maur
Maisons Alfort
le Buisson
Vitry sur Seine
Min. Saquet
Seine River
le Vert
la Varenne St. Hilaire
ORLEANS
LYON
Chennevieres sur Marne
les Meches
Créteil
Min. d'Argentblanc
Min. de Bonneuil
la Folie
Ile Barbiere
Bonneuil sur Marne
Min. d'Ambode
la Saussaye
Mesly
Mont Mesly
R. R.

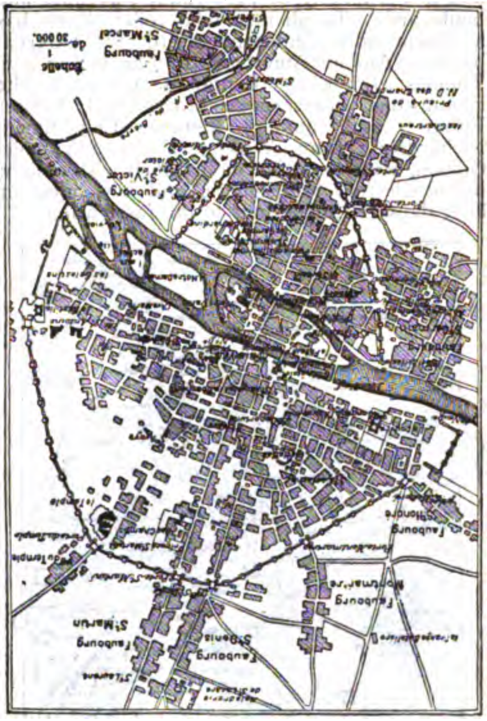
Google

of the island of Saint Louis, as it now exists, and thence, across the river, in a smaller loop which crossed the rue Soufflot at the corner of the rue Saint Jacques, and passed near what is now the garden of the Luxembourg and close to Saint Germain des Prés, to a point on the river at the Tour de Nesle about on the site of the Institute. Great chains were hung across the river above and below to complete the fortification, and towers at either end buttressed the river. A fragment of the wall of Philippe Auguste still stands in a good state of preservation at a point in the rue Clovis near the rue Cardinal Lemoine, just behind the Pantheon, and some less important traces of it are also still to be found on the right bank. Like most river cities, Paris grew down the river rather than up. The size of the city within the walls was increased by the mural enlargement of Henry IV, and later by the new and greater fortifications of Louis XIV. The grand boulevard, on the right bank, from the Bastile to the Madeleine, runs along the line of the northern walls of Louis XIV, which were thrown down and demolished by Louis XV. The present walls were the work of Louis Philippe. A project is now in hand to demolish them, at least in part, but up to the present the walls are intact and there is a disposition on the part of Parisians to insist upon maintaining the fortifications, although an interesting project for their demolition has been put forward which would give the city in their place a circle of parks and extend the avenue des Champs Elysées to the terrace at Saint Germain-en-Laye.



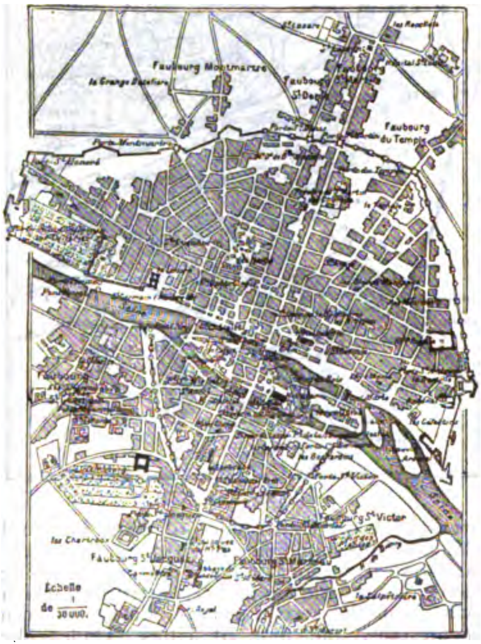
Paris under Henry IV.

Civic Art and Civic Charm.— Paris was the pioneer in the modern scheme of civil regeneration intelligently conceived and carried out in a large way. Accordingly it is now par excellence the city beautiful, and the leader in the more decoratively æsthetic features of modern civic art. Historically and architecturally it ranks with Athens, Rome and Vienna as one of the three most wonderful cities of the world. Since the work of the third Napoleon and his architect-engineer, Baron Haussmann — a work, it is fair to say, which has been and is zealously and intelligently carried forward under the republic — in opening new thoroughfares and in the construction of many new and splendid public buildings, in virtue of the essential physical regeneration of the city resulting from this construction and reconstruction which dates from the second empire, Paris has been incontestably the first of cities. Under the operation of the building laws and the regulations as to height, size, general character and style, pursuant to which Paris has been built and rebuilt for the past half century at least, the city may be said to be built to a scale — the form and quality of the construction being prescribed, and each new house as it were commencing as and where the last house left off. Paris is thus made to constitute architecturally a civic entity, an ensemble, «a city with foundations,» and not a heterogeneous and promiscuous collection of houses, with a miscellaneous assortment of taste in their construction. There is for example a uniform sky line as much as a uniform street line, with no architectural monstrosities, and with everything built under a central intelligent supervision, as part of a preconceived plan, which eliminates lawless individualism and the architectural vagaries resulting from personal caprice. Thus everything is made to conform, as part of a substantial uniformity, and to square with prescribed canons of good taste in building. The streets of Paris accordingly display a pleasing elegance which



Paris under Louis XIII.

is not the result of accident, and evince a unity in the scheme of construction, which, without being monotonous, delights the sense of order and proportion by its form and fitness. We find men coming from all parts of the globe, and seeing here something better than mere wealth of luxury and amusement, something more than splendid palaces, sumptuous edifices and a multiplicity of promenades, avenues and boulevards. To all men who reflect Paris has a charm quite independent of its external beauty. Among Americans of our heroic age, Thomas Jefferson, Benjamin Franklin, the Livingstons, Gouverneur Morris and Robert Fulton; and among literary Englishmen, Richardson, John Wilkes, Horace Walpole, Gibbon, Hume and Sterne breathed with delight its intellectual atmosphere, and few men of later days are impervious to the fascination.



Paris at the opening of the reign of Louis XIV.

How to Account for Paris — its Raison d'être.— Paris, like ancient Rome, and perhaps like earlier Babylon and in some degree like later Florence, grew great not primarily by commerce and trade nor by manufacture, but essentially as a city-state, as a capital, as the capital not alone of France but of the modern world. Consequently there is no basis for comparison with Pittsburgh, or Lille, or Manchester as a manufacturing town, or with New York or London (her only rivals in wealth and population) in trade and commerce. Her primacy is in none of these things, although necessarily she is great in trade and considerable in manufacture. It is not easy to formulate and disclose the secret of this obvious pre-eminence; but it is the pre-eminence of a capital pre-eminent. Paris is certainly exceptionally great in few things that makes a market town, while it is superlatively great in everything that makes a capital. Its evolution through the centuries has been along these lines, and its unique position among the great cities of the world is now based essentially upon the fact that modern civilized mankind has here its common seat and centre. There is in the Christendom of to-day a gravity of Paris. The whole world tends here; each individual from every country on the globe, going abroad or who has gone abroad these 1,000 years past, came and comes here — merchant, artist, student or merely curious traveler — each comes here necessarily and inevitably, each finds here his heart's desire and contributes each his mite of money and admiration. Thus Paris is the sure goal of every traveler; wherever else he may go or stay, he comes here as to a capital, and stays here as in the capital. In this way alone, as it would seem, can one account for the material as well as the spiritual greatness of Paris, which has no other adequate foundation.

This distinctive fact in the psychology of Paris grows upon one as he comes to know and to love the great city and to feel at home within her walls — a fact, moreover, not likely to be minimized by those Americans who are something more than blind provincials. It is very certainly a fact that cannot be made away with or looked out of countenance by insular, racial or political prejudice, by local conceit or by sheer intellectual inaptitude — a fact, furthermore, that appeals powerfully to the philosophical student of modern history as well as to the enlightened man of the world. Napoleon, saying "I know full well that London is a corner of the world, while Paris is its centre," formulated this idea. There is room for but one such city in such a world as ours at a time, and it takes 1,000 years to build; so that one may say, not merely as a rhetorical flourish, that what Rome was Paris is. She might still maintain this general capital position in the world — as Rome has done in matters of the spirit — although the France of which she is political capital should one day lose her present commanding position in the concert of Europe and sink, like Spain, to a fifth-rate power. Although, according to the common saying, Paris is France, it is something more; a sort of ***imperium in imperio,*** with a clientèle as wide as the world, and a vogue that extends to the verge of civilization. She has moved the centre of the world's gravity away from the city of the Cæsars and fixed it in the valley of the Seine. Set like a jewel and crowned as a queen, she holds her position sure as the head and front of the modern world, with a distinction and a grace that she never seemed less likely to lose than to-day.

The University.— Alone among the great capitals of the world, Paris is the site of the old university of the nation. The university had its cradle as early as the latter part of the 8th century on the island of the city in the cloisters of the cathedral, between the church and the larger arm of the river on the northerly side. The tradition is that the foundation dates from 780, when Charlemagne called the famous Alcuin to Paris, and established a school for him at Notre Dame. An echo of the tradition — whatever the tradition itself may be worth — has come down all the way from the 8th to the 20th century. Saint Charlemagne is the patron saint of the university, and every year on the 28th of January, which is his day in the calendar, the schools take holiday. The authentic annals, however, seem to commence with Pierre Abelard about 1107. Under him the institution still in the cloisters of the cathedral began to gain that international prestige which it has never lost. The pathetic romance of Héloise and Abelard lends a sentimental interest both to the time and to the place. The site of the house where these unhappy lovers lived is marked by a plaque on a wall on the Quai aux Fleurs. Abelard is said to have conferred upon himself the degree of doctor of divinity while he was connected with the university. Henry II of England submitted to the great council of the university his quarrel with Thomas à Becket of Canterbury in the 12th century. In 1200 it received a royal charter from Philippe Auguste; in 1208 Innocent III gave it a papal charter; and in the 14th century Charles V conferred upon it the title of «the eldest daughter of the kings.» The term «university» as signifying a collection of schools of higher learning originated in Paris. It was first employed in connection with this institution, in the Bull «*Scientiarum fontem*» of Urban IV in 1264, wherein it is designated as the «*Universitas Parisiensis.*» The degrees of bachelor and master of arts also originated here. The university remained on the island and under the shadow of the cathedral until the beginning of the 13th century, when it passed over into the rue de la Harpe on the left bank and slowly climbed up the hill of Sainte Geneviève. The first buildings of the faculty of arts were put up in what is now the Latin quarter in the 13th century near the church of Saint Julien le Pauvre in the old rue du Fouarre. The university grew and prospered throughout the latter half of the Middle Ages under the patronage of the Church and of the kings. The Faculty of Law and the School of Medicine were both founded in the 12th century, the law school dating from 1160. From the beginning of the 13th century to the end of the 16th the Sorbonne was a sort of international theological parliament which the nations and kings of Europe consulted on great political and religious questions (as, for example, Henry VIII, of England, on the annulling of his marriage with Catherine of Aragon), and which assumed the function of pronouncing upon the orthodoxy of new books, condemning to destruction by fire such as were not conformed to its ideas. As early as the 16th century the university had from 12,000 to 15,000 students, drawn from every quarter of the earth. They all learned to speak an extraordinary mixture of French and Latin, in which the work of the schools was then carried on, and it was not until the end of the reign of Henry IV that this jargon was displaced by idiomatic French. Because Latin was the language of the university, the region of the schools was called the *Pays Latin*, or, in our modern phrase, the Latin quarter. Then the language was indeed Latin of a sort; now students from every land and all tongues, except Latin, stream through the streets of the quarter with the polyglot Bohemianism of comradeship which has become such a Parisian characteristic. During the Middle Ages there were at the university separate colleges for each of the four nations, France, Picardy, England and Normandy, with much rivalry between them. After the re-entry of Charles VII to Paris in 1437, the college of England was changed to that of Germany. Seals of these collegiate «nations» are preserved in the British Museum. The university was governed by a rector for many centuries, who during the Middle Ages was the supreme power in all the territory of «*l'Université*» both in civil and criminal affairs affecting the students. It was the privilege of the students to be condemned and hanged only by the court of the rector. It is an interesting fact that the messengers of the students in the Middle Ages, who carried letters and packages to and fro for them from their homes, were the forerunners of the post office system of Louis XI, which was the first attempt at a regular postal service anywhere. The annals of this great school reaching far back into the Dark Ages constitute one of the most fascinating episodes in history. The University of Paris has, ever since about the end of the 12th century, been the intellectual centre of Europe, and the chief seat of light and learning in the world. All the other and later universities, like Oxford and Heidelberg, have been modeled after it. No other university can compare to it in the number of distinguished men it has numbered among its students. Thus, in the long roster are such names as Dante — second poet of mankind — Pierre Abelard, François Villon, Pierre de Ronsard, Tasso, Rabelais, Clément Marot, John Calvin, Ignatius Loyola, Innocent III, Francis Xavier, Erasmus, Melanchthon, Pascal, Rollin, Saint-Pierre, Descartes, Voltaire, Rousseau, Robespierre, Diderot, Condorcet, Molière, Racine, La Fontaine, Boileau, Lamartine, Sainte-Beuve, Victor-Hugo, Comte, Taine, Renan and all the moderns. At present there are ordinarily in Paris from 15,000 to 18,000 students in attendance on the courses of the

Paris at the close of the reign of Louis XIV.

university (among them about 5,000 in the law school), together with several thousand more in the various technical, art and industrial schools which work independently of the university; for example, the Collége de France, the Beaux-Arts, the Polytechnic School, École des Ponts et Chaussées, the School of Mines, the Normal School, the Conservatory of Music, Arts et Métiers, Hautes Etudes, the École des Chartes, the School of Living Oriental Languages, the special schools of art and architecture, etc. Thus there are always in Paris an average of not less than 25,000 students of one sort and another — not including the students in the various lycées and colleges — constituting in the whole a very much greater number from the four quarters of the earth than are to be found elsewhere in any one place in the world; and the university of to-day, as much as ever, is in numbers and in world-wide influence the first of schools of learning anywhere. The 27 libraries of the university contain in the aggregate, according to a recent enumeration, 1,188,000 volumes. The following statement of enrolment in 1914 and 1915 is furnished by the information department of the university:

On 15 Jan. 1914, there were enrolled 17,308 students, of whom 15,111 were males and 2,197 females; of the former 12,946 were of French and 2,165 of foreign citizenship, and of the latter 1,120 were of French and 1,077 of foreign citizenship. This total enrolment of 17,308 was distributed among the various faculties as follows: Law, 7,569; medicine, 4,397; sciences, 1,718; letters, 3,018; pharmacy, 606. On 31 July 1915 (after a year of war) the university had a total enrolment of 4,257, of whom 3,323 were males and 934 females; of the former 2,385 were of French and 938 of foreign citizenship, and of the latter 663 were of French and 271 of foreign citizenship. The enrolment in the several faculties was as follows: Law, 1,165; medicine, 1,186; sciences, 751; letters, 959, and pharmacy, 196.

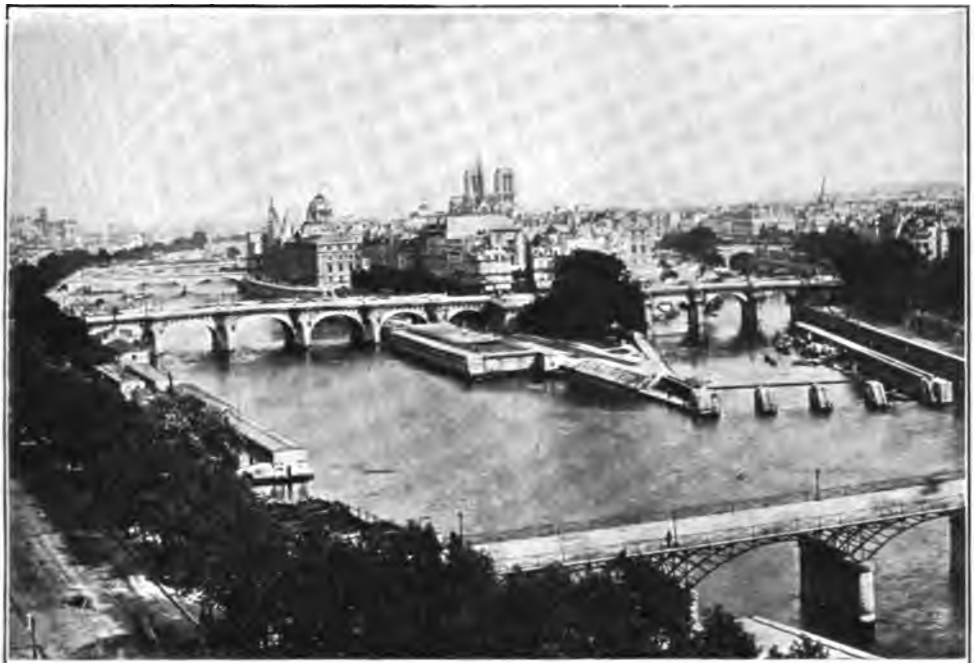
Public Instruction — the Free Schools.— The principle of free public instruction in France dates from the Revolution, but the public school system of Paris in its present form is substantially the work of the Third Republic. It commences with the maternal schools (*écoles maternelles*) directed by women, which receive children of both sexes from two to six years of age, and give them care and elementary instruction in reading, writing and ciphering. These schools are scattered throughout the city, but of course are especially designed for the poorer quarters where the many young mothers who are employed in shops and factories can place their infant children during working hours. Next come the primary schools, separate for boys and girls, which receive and instruct children from 6 to 13 years of age. Pupils go from these schools to the superior primary schools, and thence for secondary classical courses to the lycées and colleges, which confer the degrees of bachelor in letters and bachelor in science. A French boy usually takes his bachelor's degree when he is about 16 or 17 years of age. It is thus not the equivalent of the A.B. or B.S. in America, representing here on the contrary something like a certificate of graduation from an average American city high school. There are 10 superior primary schools, six lycées supported by the city, and two by the state, and three colleges; these lead to the university and the professional and technical schools. There is also a system of free public night schools for adults, both men and women. There are about 125 of these schools with some 12,000 pupils.

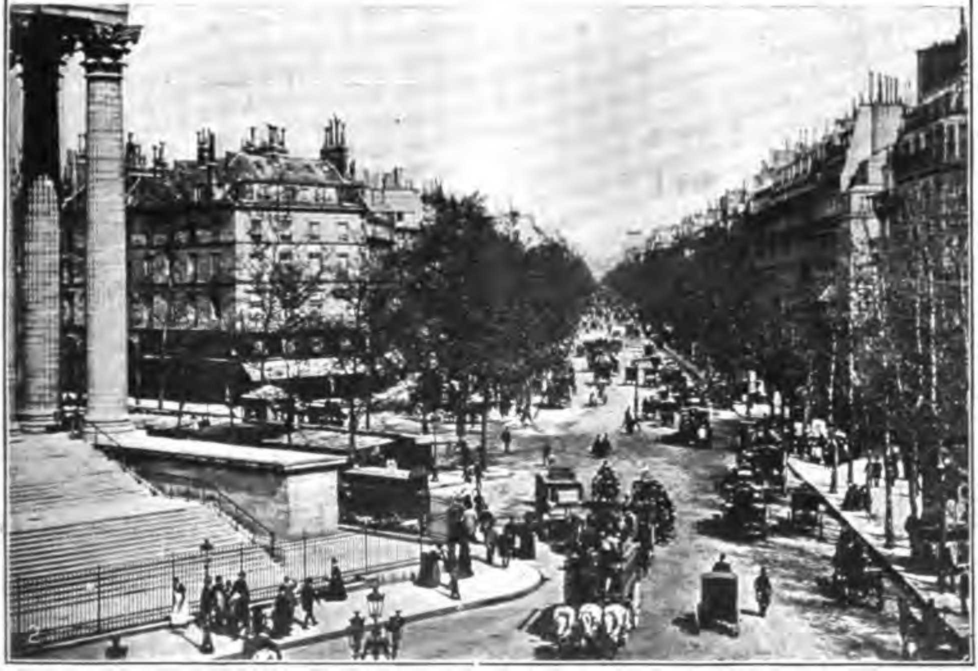
There are in connection with the various public schools about 400 libraries containing useful and instructive books to be loaned to the pupils. In addition necessary books and stationery are furnished free to all the pupils in the primary and superior primary schools. The city also furnishes to all the day scholars a déjeuner, that is, the meal at the noon hour, consisting of hot soup, meat and vegetables, prepared and served in the cuisine of the school. The children are supposed to bring in their little baskets a bit of bread and a bottle of wine, but when they do not, bread is also furnished. Some parents pay a small fee when they are able, for this luncheon, but the poor pay nothing, and by a system of copper checks, which are given out to all the pupils every day and surrendered at each meal, it is impossible to know who pays and who does not. Shoes and clothing are also provided for children whose parents are unable to furnish them. The keynote of Paris public school administration is the absolute equality of the scholars while they are in school. The tendency to clothe school children in dark blue or black blouses makes this fairly easy. Elementary education is obligatory as well as free. Mixed schools are not tolerated in Paris. During the summer vacation the city provides excursions — from a day or two to a month in length — for the children of the poor, to the seaside or to the country, sometimes to Switzerland. Each child is required to keep a diary of his excursion whether it is long or short, which is subsequently treated as an exercise in composition. The system of primary instruction is, upon the whole, an admirable one. It cares for and educates all the children of the city.

Churches.— Among the monumental buildings that adorn the capital the cathedral of Notre-Dame holds the first place. Its foundations were laid upon the ruins of a temple of Jove, first about 375 A.D., and rebuilt again and again; the present edifice upon the original site having been begun in 1163. The choir was finished in 1195, the façade in 1218 and the towers in 1225. It was the first conspicuous embodiment of the Gothic ideal in church architecture — the mother church from which has come down in ordinary generation that prolific family of Gothic churches throughout the world, which stands sentinel about the Ile de France in a widening circle from Rheims and Amiens, from Rouen, Beauvais and Chartres to Cologne and Milan, to York, Canterbury and Lincoln and to the ends of the earth.

Notre-Dame de Paris is accordingly not only one of the oldest, largest and most interesting churches in the world, but it is architecturally one of the most impressive buildings ever erected. Philip Gilbert Hamerton, than whom there is scarcely a more competent contemporary critic, says that if we leave out of view one or two Greek temples nothing ever constructed by the hand of man has been so uni-

PARIS, FRANCE





1 Ile de la Cité

2 Boulevard de la Madeleine

PARIS, FRANCE

Eiffel Tower

versally admired as the façade of Notre-Dame — and that is also almost true perhaps of the whole structure. There is about it an indescribable charm. Neither Saint Peter's nor Milan nor Saint Mark's so nearly satisfies the highest religious and æsthetic emotions.

Victor Hugo well characterized it as a "vast symphony in stone." And Hilaire Belloc, to whom the great church so poetically appeals, says:— "To a man who knows and loves the city, there soon comes a desire to constantly communicate with the memories of the cathedral. And this desire, if he is wise, grows into a habit of coming close against the towers at evening, or of waiting under the great height of the nave for the voices of the middle age." Although it is more than 700 years old it is in an excellent, almost perfect state of preservation, the conscientious and intelligent restoration of the entire structure by Viollet-le-Duc at the middle of the last century leaving little to be desired. Its towers were the most conspicuous monuments of mediæval Paris, and from their base all distances from Paris are calculated. It is interesting to note here that all the churches and historical monuments of France are catalogued by the Ministere des Beaux-Arts and that no restoration or so-called embellishments can be made without passing through the "service d'architecture des Monuments Historiques" so ably directed by M. Paul Léon.

Next after Notre-Dame the most interesting church in Paris from an architectural point of view is the Sainte Chapelle at the Palais de Justice. It is said to be the most perfect specimen of pure Gothic architecture in existence. It was built by Louis IX in 1245. Here for many generations until recently was celebrated every year at the opening of the courts in October the "red mass," attended by the bar and the judges in their scarlet robes. This mass is now said at Saint Germain l'Auxerrois. During its long history this beautiful chapel royal has been the site of many coronations and other kingly ceremonies. Saint Julien le Pauvre, which in its origin goes back to the first centuries of the Christian era, is a little church in the Latin quarter built in the 11th century. It stands just out of the rue Saint Jacques in the rue Galande. It is interesting not only as a beautiful specimen of early Gothic, but also because it was for many years a sort of chapel to the university, where the council was convoked, and where the rector had his official seat. Saint Germain des Près, in the boulevard Saint Germain, founded by Childebert in 543, with its barbaric tower of the 9th century, is the most venerable monument on the left bank. Saint Eustache, at the markets, begun in 1532, a church of great size and impressiveness; Saint Sulpice, near the Luxembourg, with its great organ and fine music; Saint Roch, in the rue Saint Honoré from the steps of which Bonaparte, then a young officer of artillery, trained his cannon upon the mob at the commencement of the Revolution, and from which he may accordingly be said to have set out on his extraordinary career; Saint Augustin in the boulevard Malesherbes, and Saint Clotilde near the Palais Bourbon, two modern churches of great size and beauty; Saint Thomas d'Aquin, the most fashionable church of the faubourg Saint Germain; Saint Etienne du Mont, under the shadow of the Pantheon, with its beautiful jubé, or rood-loft, of exquisite workmanship, and the two graceful staircases ascending to it, the jubé dating from 1609; the Madeleine, in the grand boulevard; Saint Vincent-de-Paul, with its splendid approach from the rue LaFayette, and Saint Germain l'Auxerrois at the Louvre, are among the most notable of the churches. The new and splendid church of the Sacré Cœur on Montmartre, commenced after the war of 1871, and conceived in expiation of the murder of the archbishop of Paris by the Commune, is the most considerable religious edifice which has been built in modern times. It has already cost upward of $8,000,000, and is still far from completion. Paris is divided into 70 parishes, and there are in all about 140 places of worship, of which 86 are Catholic. Almost every sect in the world has a church in Paris, and religious services are conducted in all the principal languages of civilized and semi-civilized mankind. The churches of Paris are among the most interesting features of the city, entirely apart from any religious consideration; so much of the stirring history of the town is written in the stones of her great churches.

Galleries of Art and Museums.— The Louvre with its unrivaled collection of *objets d'art* is the chief art gallery of Paris. The Louvre itself was a royal castle from the days of Philippe Auguste until Louis XIV built the palace at Versailles. The existing structure which superseded the work of Philippe Auguste was begun by Francis I in 1541, and was added to and extended by his successors down to and including the third Napoleon. As finally completed it constitutes the grandest urban palace in the world, and one of the most extensive and historically interesting buildings on the earth. Since 1793 the greater part of the interior has been occupied by the famous museum and art galleries of the Louvre, although the wing on the rue de Rivoli is occupied by the Ministry of Finance. It may be said to be the most important public building in Paris. It has an unrivaled situation on the Seine and on the rue de Rivoli, facing the gardens of the Tuileries and the Place de la Concorde. It covers an area of more than 48 acres, and only the papal palace of the Vatican can be compared to it for size and magnificence. It is interesting to note by way of comparison that the public buildings in Philadelphia cover 4½ acres, the Louvre being thus in area 10⅔ times as large. The galleries contain a vast collection of paintings, sculpture, objects of art and antiquities to which only the collections of the Pitti-Uffizi Gallery at Florence and of the Vatican at Rome can fairly be compared. They are free, and open to the public at fixed hours daily. The next gallery in importance and interest is that of the Luxembourg, in the gardens of the Luxembourg adjoining the palace. It is a museum of no great size of living artists, opened in 1886. There is a plan now in hand to rebuild and enlarge it by annexing the adjacent Seminary of Saint Sulpice. Among the great number of other collections may be mentioned the Musée Cluny, in the boulevard Saint Germain, dating from 1840, possessing not only the interesting Roman ruins of the ancient Palais de Thermes, but also a valuable collection of mediæval furniture and objects of art from the Middle Ages; the Musée Carnavalet — the museum of the city of Paris — containing an invaluable collection of objects connected with and illustrating the history of the city in all its centuries of existence, located in the hotel of Madame de Sévigné, in the rue de Sévigné, in the Marais, once the centre of fashionable life, but now rather a neglected quarter; the Musée of Artillery at the Hotel des Invalides, containing a very large collection of arms, ancient, mediæval and modern, of all sorts, cleverly displayed in a chronological order; also Napoleon's camp bed, some of his uniforms, the famous gray overcoat and many of his camp furnishings; the Musée of the Trocadéro, which contains a collection of sculpture illustrating various phases of ancient and mediæval architecture, being especially rich in early French churches and royal tombs, together with an interesting ethnographic exhibition; the Musée Guimet; the Musée Galliera, in a new and palatial structure of exceptional artistic beauty, in the rue Galliera, not far from the Trocadéro, etc.; the long list including more than 50 separate public collections of varied and general interest. No city in the world contains a greater number of valuable private collections, many of which are accessible to students and sightseers, on proper introduction.

Libraries, Books and Publications.— No city was ever so rich in books and libraries and literary treasure as Paris. The Bibliothèque Nationale has always been unrivaled. It has been known in its long history successively as La Bibliothèque du Roi, Royale, Nationale, Impériale, and now Nationale again. It was founded in the 14th century by John II, and then consisted of but 8 or 10 volumes; it was housed at first in the Palais de la Cité. Charles V is sometimes called its founder because he removed it to the Louvre and increased it to 910 volumes during his reign. Some books of Charlemagne's are said to be included in this first collection. Francis I transferred it to Fontainebleau, but it was brought back to Paris by Henry IV. Subsequently it was stored in various places in the city, but was finally located in the Palais Mazarin, in the rue Richelieu, now more than 200 years ago, where it has since remained. Although it is a building of vast size, it has recently been greatly enlarged by a splendid addition in the rue Vivienne. Under Francis I it contained 1,890 volumes; 16,746 under Louis XIII; 50,542 under Louis XIV; and about 100,000 at the time of the destruction of the religious houses during the Revolution, at which time their libraries were incorporated with it. It now contains 4,050,000 printed books, 100,000 manuscripts, 2,500,000 plates, engravings, stamps and maps, and 120,000 medals and inscriptions. It is a public library, free for study, reading and reference, with no vexatious restrictions, at all times except holidays. Other noted libraries are the Bibliothèque Sainte Geneviève, with 400,000 volumes and 3,500 manuscripts; the Bibliothèque de l'Arsenal (which, after the Bibliothèque Nationale, is the finest in Paris), with 620,657 volumes, 10,000 manuscripts, 2,500 cases containing papers and documents from the Bastille, and 100,000 engravings; the Biblothèque Mazarine, with 250,000 volumes and 5,000 manuscripts; and the Bibliothèque de la Ville, with 400,000 volumes, 25,000 manuscripts and 75,000 engravings and charts. There are also many technical libraries at the various schools and colleges of the university and elsewhere for the use of students and investigators. In addition to the libraries of the university (1,188,000 volumes), to which reference has already been made, mention should be made of those of the Senate, of the Chamber of Deputies (250,000 volumes), of the Council of State at the Palais Royal, of the Institute, of the School des Beaux-Arts, of the School of Mines, of the Hotel des Invalides, of the Chamber of Commerce, of the several ministries (War, Marine, Colonies, Justice, the latter containing 40,000 volumes), of the Conservatory of Music, of the Opera, of the Theatre Français, etc. The Archives Nationales must also be mentioned in any enumeration of Parisian libraries. It occupies the beautiful hotel Soubise, in the Marais, and, as its name indicates, contains a collection of national archives dating from the Merovingian kings, an immense number of charters, maps, letters, documents of all sorts, of the kings, of the Parliaments, of the empire, and of the ancient Parisian jurisdictions like the Chatelet, the Chamber des Comptes, etc. From this enumeration of the literary treasure of Paris, it is clear that nowhere else are there such facilities for study and historical research as here. The city of Paris, moreover, maintains 79 free public libraries — two or more in each of the 20 arrondissements — for lending books to laboring people and students, at most of which reading-rooms, suitably warmed and lighted, are opened in the evenings for the use of persons who are engaged during the day. According to a recent enumeration made for the Library of Congress in Washington there are in the 17 principal public libraries of Paris a total of 8,750,657 volumes, as against 5,740,406 in the libraries in London and 3,430,094 in Berlin, or about as many books in Paris as in London and Berlin combined.

There are 146 daily newspapers in Paris (many of them in foreign languages), which is more than the total number published in New York, London and Berlin combined. The leading daily papers are *Le Figaro*, a temperately ministerial organ and the organ of society, a paper that had a certain notoriety from espousing the cause of Dreyfus; *Le Gaulois*, the organ of the Church and the old aristocracy, conducted by Arthur Meyer, a clever Jew who has been Christianized and has married into the family de Turenne; *Le Matin*, an enterprising, newsy paper; *Le Journal*, a paper in favor with the mercantile and commercial classes; *L'Echo de Paris* and *L'Eclair*, both journals of large circulation and influence; *l'Intransigeant*, founded by Henri Rochefort, who was long one of the most accomplished men on the Paris press and whose paper is always implacably hostile to the government; *Le Journal des Débats*, a conservative organ of high character but of no very large circulation; *L'Autorité*, the Bonopartism organ of Paul de Cassagnac, the famous duelist, whose skill in journalism was quite comparable to that of Henri Rochefort; *l'Humanité*, founded by Jean Jaurès, as the organ of the advanced Socialists. It was at its foundation supported actively by Anatole France and other literary men of Socialistic tendencies; *La Croix*, the Church organ par excellence, with an enormous circulation in Paris and the provinces; *Le Temps*, the leading evening paper, conservative and serious, and read by the best people; *La Patrie*, a sensational evening organ, with an immense following; *Le Petit Journal* and *Le Petit Parisien*, the two great organs of the masses, each with a circulation exceeding 1,000,000 copies daily; *La Libre Parole*, edited with ability by the late Edouard Drumont, a violently anti-Semitic organ; *La Gazette de France*, an exceedingly conservative sheet, which dates back to 1631, making it, as it claims, the oldest newspaper in the world in any language. According to *L'Annuaire de la Presse française et du Monde politique*, there were a few years ago in Paris 3,442 periodical publications (of which over 1,400 were newspapers), a number at least three times as great as that of any other city. Furthermore, the annual output of books from the Paris press is said to exceed the total output in the English language from all sources. Nothing suggests better than the foregoing statements the intellectual activity of the French capital.

Financial Paris.— Chief among the financial institutions of Paris are the Bank of France and the four great private banks, the Crédit Lyonnais, the Comptoir National d'Escompte, the Société Générale and the Crédit Industriel et Commerciel. The banking business of the city is largely in the hands of these five institutions. The Crédit Lyonnais has a sumptuous banking house in the boulevard des Italiens, a capital of 250,000,000 francs, a surplus of 100,000,000 francs, and real estate of the value of 37,000,000 francs, with deposits, 31 Dec. 1904, of 1,656,000,000 francs. It has 65 branches in Paris and the suburbs, 140 branches throughout France and 17 branches in foreign countries, including two in London. It has behind it the financial power and prestige of the Rothschilds, and its influence is felt in financial circles everywhere. It is unquestionably the largest and most powerful private bank in the world. The Comptoir National d'Escompte has a capital of 200,000,000 francs, 61 branches in Paris and the suburbs, 98 throughout France and 19 abroad. The Société Générale has a capital of 500,000,000 francs, 102 branches in Paris and the suburbs, 306 throughout France and one in London. The Crédit Industriel et Commerciel has a capital of 126,000,000 francs and 52 branches in Paris and the suburbs. These four institutions, with aggregate capital exceeding $200,000,000, thus furnish Paris about 280 banks, with 550 branches in France and 40 abroad. There are, of course, many other smaller banking institutions in Paris. The Bank of France, like the Bank of England, is a private joint-stock bank, and not an institution of the state. It has, however, the sole right to issue bank-notes which are guaranteed by the state, and is thus peculiarly subject to governmental control. Its ordinary banking business (aside from the business it transacts for and with the government) is on the most extensive scale. The idea of a Bank of France originated with Francis I, who established, in 1543, at Lyons, the first national bank. But the bank in its present form was organized in February 1803 by the First Consul, with a capital of 30,000,000 francs, which has since been increased from time to time, until it is now 182,500,000 francs. Napoleon's name heads the list of the first subscribers to the capital stock of the bank. The limit of note issue fixed by the government is 4,000,000,000 francs, or about $800,000,000. This limit is, however, generally exceeded, and, by a late report of the bank, it appears that there were then outstanding notes to the amount of 4,510,000,000 francs. The gold and silver treasure of the bank, on the same day, was 4,750,000,000 francs, which amounts to the enormous sum of $950,000,000. The bank has 445 branches throughout France. The chief office is in the rue de la Vrillière, in the old hotel de la Vrillière, to which extensive additions have been made from time to time. It contains a handsome apartment of the 18th century, called the Gallere Dorée, to which visitors are admitted. The cellars and vaults of the bank are of elaborate construction, and can be flooded with water at a moment's notice on an alarm of attempted burglary. The remarkable financial strength of Paris nevertheless contained within itself an element of weakness for the country, in that a large proportion of French savings were systematically exported abroad to needy foreign states, while domestic development was neglected. English treasury bills, exchequer bonds, bankers' acceptances and other sorts of English short-dated securities quickly find their way to Paris, and a volume of the best short-time New York paper is also always found in the thick portfolios of the Paris bankers. For many years previous to the war the rate of the Bank of France had fluctuated very slightly, being generally maintained at 3 per cent. During an economic crisis it was raised to 3½ per cent on 29 Jan. 1914; to 4½ on 30 July 1914; to 6 per cent on 1 Aug. 1914, and reduced again to 5 per cent 19 days later, at which figure it still remained in May 1919. Before the war Paris was the ready money centre of the world, for nowhere was there a larger stock of available funds than in France. «We are perhaps the biggest money-lenders in the world,» said a French finance minister in 1911, but he deplored the non-existence of «organisms the sole object of which should be to assist small business men and manufacturers.» Paris was the only monetary institution in the world through which, for example, such transactions as the cash payment of $40,000,000 in gold coin for the Panama Canal, or even the payment of the $20,000,000 in gold which we made to Spain for the Philippine Islands, could have been arranged. Both these payments were made over the counters of the Bank of France. The war of course modified essentially the ordinary operations of the bank. With the *com forcé* it issued bank notes without reference to the legal limit and is financing the government in the larger way. The gold reserve has been very largely increased.

La Bourse.— The Bourse was founded in 1734, but the Change de Paris, out of which the Bourse grew, has a history running back to the first years of the 14th century (1304 A.D.). Stockholders, or *agents de change*, operated for many years in the old rue Quincampoix in the Marais, and later in the Place Vendôme and in the hotel de Soissons, on the site of which now stands the Bourse de Commerce, which is the Parisian Produce Exchange. The present Bourse or stock exchange building was begun in 1808, when Napoleon laid the corner-stone. It was completed in 1826 and opened by Charles X. The Palais de la Bourse, as it is called, is a handsome building, in the Græco-Roman style, surrounded by a series of 82 Corinthian columns, 33 feet high and 3½ feet in diameter. The setting and the architectural effect are fine, suggesting the temple of Vespasian in the Forum at Rome. The length (exterior) is 225 feet; the width, including the new wings, 215 feet; and the height 100 feet. The hall is 105 by 57 feet, with wings on either side in the recent addition, about 40 by 60 feet each in size. It is a shapely and commodious room, and the decorations are artistic. The Bourse stands in a block by itself, facing the fine Place de la Bourse, which is about midway between the boulevard Montmartre and the Bank of France. While there are 1,100 seats in the New York Stock Exchange, and near 5,000 (4,085 in 1919) jobbers and brokers on the London Stock Exchange, there are only 70 memberships in the Bourse. They are, therefore, more valuable than memberships in any other exchange in the world, being worth at present from $350,000 to $500,000. The position of *agent de change* is a quasi-governmental one, the appointment to the office being by the Minister of Finance, and the operations of the Bourse being, at least indirectly, under the control of the state. The membership, or, as we say, the seat, is a life estate, which can be disposed of by will to a son or nephew only, and that subject to governmental approval. The hours are from 12:30 to 3 o'clock each business day. The *agents de change* have an exclusive privilege of negotiating transfers of public funds and the sole right of buying and selling securities of all kinds on the Exchange. The annual amount of business transacted in ordinary times is estimated at 100 milliards of francs, or $20,000,000,000. The foreign list, which is dictated by the government, consists of the obligations of all the other nations of Europe except Germany (Russian, Spanish and Turkish securities were generally favorites), the bonds of the more solvent and responsible countries of South America, and of Egypt and Morocco. The bonds and stocks of some foreign railways are also listed, as well as those of many foreign industrial concerns, like the Rio Tinto mines in Spain, the Suez Canal, etc. Few American securities have yet been listed, but just before the war efforts were successfully made to increase this list. German securities are never dealt in, and English investments are not favorites. There is, however, some trading in English consols. The obligations of the Crédit Foncier are also largely dealt in. This is a financial institution of enormous resources — quasi-governmental in character — organized in 1852, for the purpose of lending money, primarily on the security of real estate. It is said to be one of the fundamental institutions of public credit in France, and is of great service to the communes in advancing them money for public works. Its securities are a favorite investment. *La Coulisse,* a sort of loose association of unlicensed *agents,* whose transactions are purely speculative and carried on during business hours, corresponds in a way to the "Curb" of the New York Stock Exchange. *La Petite Bourse,* a somewhat similar organization, carries on speculative transactions in the daytime, before and after the hours of the Bourse. *La Bourse du Soir* is the name for a group or groups of speculators who meet and trade or speculate in the evening, suggesting roughly the famous evening meetings of stock-brokers at the old Windsor Hotel in New York.

The American Chamber of Commerce in Paris.— This institution was founded in 1894, mainly through the efforts and initiative of Dr. Stephen H. Tyng, then the Paris representative of the Equitable Life Assurance Society. It has its offices at 3 Rue Scribe, and represents in its corporate capacity the commercial interests of the United States in France. In 1916 it reported 440 active members (of which 284 were resident) and 72 honorary members, from among the most substantial class of American bankers, professional people, manufacturers and merchants resident in Paris or interested in French business. The American Ambassador for the time being to the French Republic, and the consul-general of the United States in Paris, together with the presidents of the chambers of commerce in most of the chief cities of the United States, are honorary members. A library and reading-room is maintained, and the work of the chamber is efficiently carried on. It is quite the first such institution in Europe and performs a very useful function both commercially and socially.

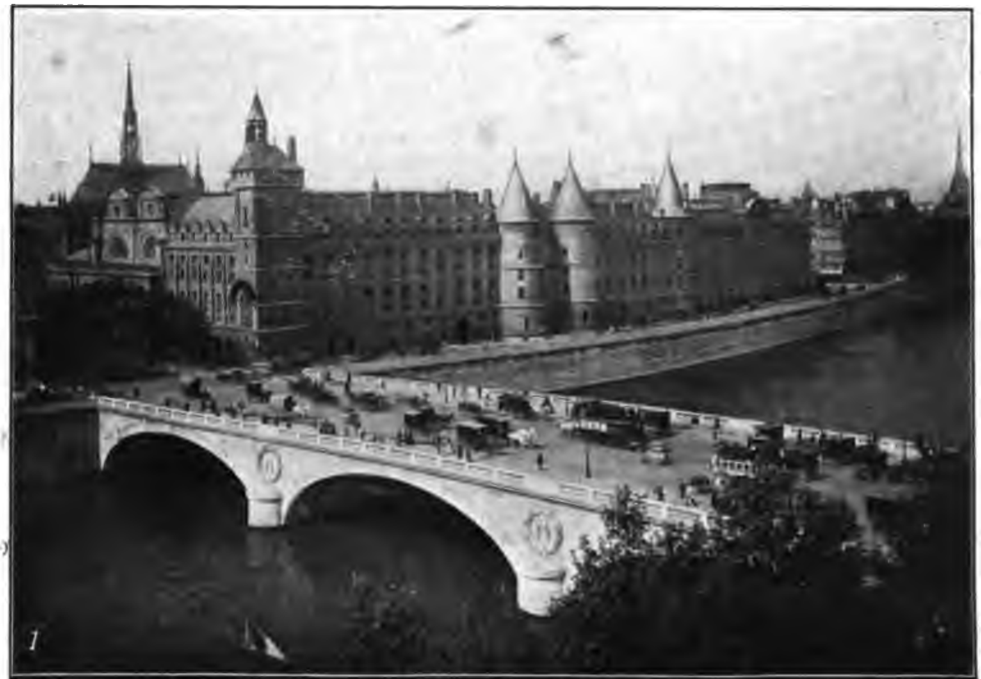
The Hotel de Ville.— In any history of Paris the Hotel de Ville and the events, political and revolutionary, which have occurred there must have a prominent place. Its history is bound up inseparably with what is best and most inspiring in the annals of the capital. For almost 550 years it has been the town-hall of Paris, the centre of its civic life, and it has at every stage played a conspicuous part in the different revolutions as the rallying place of the republican or democratic party. Indeed, it may not untruly be said that universal suffrage and democracy in the modern sense were born there. It was in 1357 that Etienne Marcel — first of democrats, and the most famous of the ancient *Prévôts des Marchands* — purchased for the city of Paris "the House of Pillars" on the Place de Grève and established there the municipal headquarters, which had theretofore been at the Parlour of the Bourgeois, on the other side of the river. This latter ancient municipal structure — in reality the first Hotel de Ville — dated from the 9th century, and was built against the city wall at a place near the rue Soufflot. The House of Pillars continued to be the seat of the municipality until it was demolished by Francis I in 1532, to make room for the new Hotel de Ville, begun by him in that year and completed in the reign of Henry IV. It contained the residence and offices of the chief municipal functionary of the city, who was called the *Prévôt des Marchands* down to the Revolution, and thereafter *Préfet de la Seine.* This building was enlarged and reconstructed from time to time, and was finally destroyed in May 1871 by the Commune. The present building, which may be described as an enlarged reproduction of the original, was undertaken by the republic shortly after the war of 1871. It is, architecturally, one of the finest buildings in Paris, and one of the most beautiful municipal buildings in the world. It is a rectangular structure in the style of the Renaissance, with the most elaborate ornamentation, exterior and

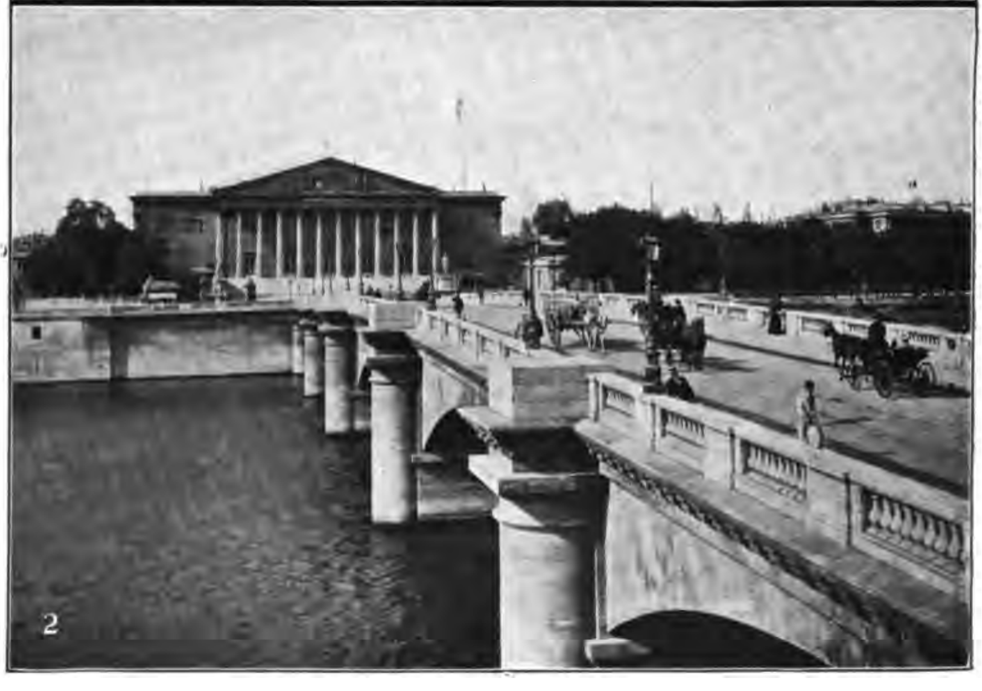
PARIS, FRANCE

1 The Cathedral of Notre Dame

2 The Senate

PARIS, FRANCE





1 Pont Au Change and the Palais De Justice 2 Pont De La Concorde and the Chambre Des Députés

interior. After the Grand Opera, it is the most sumptuous public edifice in Paris. The Place de l'Hotel de Ville, formerly the Place de Grève (that is, river bank), was anciently the place of execution. In 1572, after the massacre of Saint Bartholomew, Catherine de Médicis condemned the Huguenot leaders to perish on the gallows here, and from that time to the close of the Revolution it witnessed a long series of political executions. The colors of the city of Paris — red, white and blue — have for centuries been the recognized colors of democracy. They became in 1775 the colors of the American republicans, and in 1789 of French republicans. So that the American flag and the French tri-color alike hark back to the banners that Etienne Marcel flung out, as the badge of his mediæval republicanism, from the House of Pillars on the Place de Grève, at the middle of the 14th century. From that day to this the spirit of Paris has been democratic; it has always been more or less at swords' points with the crown, the head and front of the third estate.

The Senate and Chamber of Deputies.— Next after the Louvre, the Palais du Luxembourg, which is the seat of the Senate, is perhaps the most notable palace in the city. It was erected in 1615–20 for Marie de Médicis, the widow of Henry IV, and was modeled in general after the Pitti Palace in Florence. Its name comes from the fact that it is built upon the site of the ancient hotel of the dukes of Luxembourg. It has at times been used as a prison, especially during the Revolution and shortly after. The Musée du Luxembourg — a gallery of modern art — and the fine gardens of the Luxembourg adjoin it. The Senate chamber is a handsome room, richly decorated, in the part of the building next to the gardens. It is in form a double hemicycle, the larger with 300 seats and desks for the senators, the smaller for the president of the Senate. The light comes from the dome, and the general effect is dignified and imposing. The Palais Bourbon, in which the Chamber of Deputies has its seat, is situated on the left bank of the Seine, facing across the river to the Place de la Concorde. It was built by the Prince de Condé in 1722 at a cost exceeding 20,000,000 francs. In 1790 it was confiscated, and became national property. Both the Senate and the Chamber of Deputies (the procedure in each being essentially the same) are especially interesting to American visitors, not only as the legislative assemblies of the other great republic of the world, but as exhibiting in their procedure several striking contrasts to our own Senate and House of Representatives. The most notable, perhaps, is that, when the members speak, they address their fellow members (and not the presiding officer) from the tribune, a raised platform or pulpit in front of and a little below the desk of the president — which seems to have some advantage. They vote by blue and white cards or tickets deposited in urns, which are carried about, when the vote is taken, by the huissiers, the white ballot being for and the blue against the measure under consideration. Another difference is that no member is entitled to speak on any question unless he has given notice in advance by inscribing his name on the list of speakers. The presiding officers wear full evening dress. They call to order by ringing a bell, and the close of the session is announced by the president's putting on his silk hat.

The Palais de Justice and the Courts.— Few buildings in Paris are more interesting than the ancient *Palais de la Cité*. Situated near the western end of the island of the city, it was a royal residence continuously from the time of the Roman occupation to the latter part of the 14th century, since which time it has been exclusively devoted to the use of the courts. It was the seat of government under the Romans almost or quite from the commencement of their domination. And thereafter under the successive dynasties that lived and ruled in Paris, for the thousand years from the Roman evacuation to the end of the Hundred Years' War, it was continuously the seat of the king's courts and of the Parliament of Paris, which, in their varying forms, were through the ages the supreme court. Abandoned as a royal residence, and later presented to the Parliament by Charles VII in 1431, it became the Palais de Justice, thus perpetuating its judicial character. It has therefore been the seat of justice in Paris in one form or another from the time of Christ. Hilaire Belloc speaks of the "square mass of the Palais, whence, uninterruptedly, for 1,800 years the government has held its courts and its share in the administration of the town." It has of course been built and rebuilt again and again. The present building dates from the reconstruction of Robert the Pious in the 11th century. Louis IX in the 13th century and Philippe le Bel at the commencement of the 14th century made considerable additions to it. The Sainte Chapelle was the work of the former, and the tower at the northeast corner the work of the latter. The great tower clock dates from 1370, having been, however, reconstructed in 1685 and again in 1852. It is the oldest public clock in France. One of the most interesting features of the present building after the Sainte Chapelle is the *Salle des Pas Perdus*, an immense hall, consisting of two vaulted galleries 240 feet long, 90 feet wide and 33 feet in height, which serves as a sort of vestibule to most of the civil courts of first instance. It is the place where the avocats congregate when not engaged in the trial of their causes, and where they meet their clients. Many historical reminiscences attach to it. It dates from Louis IX, and was long known as the Grande Salle. Booksellers anciently had stalls there, and the clergy were for a long time permitted to perform there moral plays and farces. Visitors are shown the kitchens of Saint Louis, in the oldest existing part of the building, next to the river. Near by and in the same part of the palais is the Conciergerie, a prison famous in French annals, where, for example, are to be seen the chamber in which Marie Antoinette was imprisoned and the cell occupied by Robespierre. Among the numerous court rooms the most notable are the chambers of the Court of Cassation and of the Court of Appeal, both large and sumptuous rooms, with superb decorations. The great hall on the western side next to the Place Dauphine is called the Vestibule de Harlay. It contains statues of the four French monarchs most conspicuous as legislators — Charlemagne, Philippe Auguste, Saint Louis and Napoleon — and rivals the *Salle des Pas*

Perdus in size. Opposite the Palais de Justice, across the boulevard du Palais, is the Tribunal de Commerce, dating from 1866. It has a conspicuous dome 135 feet in height. Most of the courts of general jurisdiction in Paris sit in one or other of these two buildings.

At the head of the judicial system of Paris is the Minister of Justice. He appropriately conserves the ancient title of *Garde des Sceaux*. The Ministry of Justice is in the Place Vendome. The *Conseil d'Etat,* with 45 members, which in some of its functions is a tribunal, and the *Cour des Comptes,* with 84 members, are at the Palais Royal; but all the other general courts are on the island, at the Palais de Justice or the Tribunal de Commerce. First of the courts is the *Cour de Cassation,* with 45 judges, divided into three chambers. Next comes the *Cour d'Appel,* with 62 judges, divided into nine chambers. Then there is the tribunal of first instance, with 70 judges, divided into 12 chambers. These are the three superior tribunals of both civil and criminal jurisdiction. The *Tribunal de Simple Police,* a general court for petty offenses, sits also at the Palais de Justice; it is held by the *Juges de Paix,* sitting in rotation for short terms. The *Tribunal de Commerce,* a commercial court, with 21 judges, has its seat at the Tribunal de Commerce. There is also in each of the 20 arrondissements a civil court (*Justice de Paix*) of inferior jurisdiction, and in each of the 80 *quartiers* a criminal court (*Commissariat de Police*) of limited jurisdiction. Such is a general outline of the judicial system under which Paris is governed. The jurisdiction of each of these courts is roughly suggested by their names. The tribunal of first instance is the ordinary court of general jurisdiction, from which there is an appeal to the *Cour d'Appel,* and thence in certain cases to the *Cour de Cassation*. Commercial cases, however, between merchants and traders are heard by the *Tribunal de Commerce,* which has exclusive jurisdiction in that class of cases. The procedure in all the trial courts is characterized by directness and simplicity. There are no juries in civil cases, and in criminal cases a majority verdict of the jury suffices.

The Observatory and the Mint.— The Observatory has a history going back to 1371. The work was at first carried on in a building which stood on a site northwest of the hotel de Cluny, and which would now be in the middle of the boulevard Saint Germain. Charles V provided the necessary instruments and charts and endowed two scholarships there for the study of astronomical science, the holders of which were called «King's Scholars,» it being expressly provided that they were to study only such works as were not forbidden by the Sorbonne. The present Observatory, however, was founded by Louis XIV in 1672. It is an institution of great reputation, and is in telegraphic communication with the most important of the other observatories of the world. It is situated at the end of the avenue de l'Observatoire, south of the Luxembourg. The meridian of Paris is traced through the large hall on the second floor, and the latitude of the south façade is held to be that of Paris. The intersecting point of these two lines is the base from which all geographical and astronomical calculations are made. The meridian was first accurately calculated in the reign of Louis XV, although it had been fixed at the Observatory in the preceding reign. The Academy of Sciences has traced it in various other parts of Paris; for example, through the church of Saint Sulpice, through the gardens of the Palais Royal and across the top of Montmartre, at each of which places it is marked. At the Palais Royal a little cannon is set in the axis of the meridian, so that the sun by an ingenious contrivance can fire it off every day exactly at noon.

The Mint (*Hotel des Monnaies*) is a large and handsome building on the Quai de Conti east of the Institute, erected in 1771–75. The façade is 400 feet long. The work shops where money is coined are well worth a visit. Aside from the French coinage, which in amount is the largest in the world, these ateliers coin much money for other countries, and also many medals of all sorts. The processes are freely shown and explained to visitors. The machines for the coinage of silver are especially interesting, 60 pieces of money being struck by each of them per minute, with a daily maximum capacity of 2,000,000 francs in value. The assaying and stamping of the gold and silverware of the jewelers is also done here. There is a museum (*Musée Monétaire*) in connection with the Mint, which contains a very complete collection of French coins, arranged chronologically, from the earliest times to the present day; also many foreign coins, among them a good collection of our United States coins, and, by way of a curiosity, a Chinese coin of 1700 B.C.

The Institute.— Chief among the literary organizations of Paris is the Institute. It is installed in the ancient College Mazarin, or the College of the Four Nations, founded by Mazarin, situated on the left bank, at the end of the Port des Arts, opposite the Louvre. The building dates from the latter part of the 17th century, and stands on the site of the hotel de Nesle. During the Revolution it was used as a prison; but in 1795 it was ceded by the Convention to the Academies, or Societies of Savants, which had theretofore been housed at the Louvre. The Institute, which was created 25 Oct. 1795, embraces the five academies, namely, the Académie Française, founded about 1629 by Richelieu; the Académie des Inscriptions et Belles-lettres, founded in 1635 by Colbert; the Académie des Sciences, founded in 1666; the Académie des Beaux-Arts, founded in 1819; the Académie des Sciences Morales et Politiques, founded in 1666, but suppressed in 1803 and re-established in 1832. Each of these academies has 40 members, except the Academy of Sciences, which has 66, and all except the Académie Française have honorary, corresponding and foreign members. They are for the most part independent and separate bodies, but all five unite in an annual meeting «under the dome» on the 25th of October, which is one of the great literary solemnities of the Paris year. The Académie Française, the most distinguished of the five — its members being dubbed «the 40 immortals» — is charged with a superintendence of the language, the orthography and pronunciation, and with the publication and periodical revision of the Dictionnaire de l'Académie (last edition, 1878). The functions of the other four are sufficiently indicated by their names. The title «Membre de l'Institute,» and especially the title, «de l'Académie Française,» are objects of the highest ambition of every literary man in France. No other country has so complete an organization of its literary and scientific men as the Institute de France, and nowhere else are the leaders of thought so bound together and so marshaled for concerted effort under one roof as in these five academies. Vacancies as they occur are filled by ballot of the surviving members, each of the academies for itself, subject to the approval of the government. No one is eligible except French citizens, but they need not be native born citizens. They must, however, live in Paris.

Assistance Publique.— Assistance Publique in Paris dates from the tax which Louis XIV imposed, in 1677, on the gross receipts of the theatres for the benefit of the hospitals and asylums. This tax exists to-day and for the same purpose. Until about 75 years ago it was paid personally by each person who entered the theatre as he bought his ticket, but at a separate window established for the purpose. Now it is 10 per cent of the price of the ticket and is assessed against the theatre itself. Numerous hospitals and asylums existed in Paris during the Middle Ages. The principal one was always the Hotel Dieu, and it is still the first of Parisian hospitals. It is situated on the island of the city near Notre Dame. The present building was erected in 1868–78 at a cost of 45,000,000 francs. It is admirably fitted up with 828 beds. It is said to be the oldest hospital in Europe, having been founded in 660 A.D. under Clovis II. There are about 20 other general public hospitals in Paris, which have an aggregate of upward of 33,000 beds; among which may be mentioned La Pitié near the Jardin des Plantes, with 729 beds; the Charity Hospital, a large and ancient institution in the rue Jacob, and the military hospital of Val de Grace in the Latin quarter, formerly a Benedictine convent founded by Anne of Austria, but converted by Napoleon into a hospital for soldiers. The church connected with it, formerly the convent chapel, is a splendid building, being a reduced copy of Saint Peter's at Rome. The dome, 53 feet in diameter and 133 feet high, is one of the most conspicuous monuments of the left bank. Among the numerous asylums, the most notable is the Salpêtrière, undoubtedly the largest such institution in the world. It is situated near the Pont d'Austerlitz on the left bank, and was originally an arsenal built by Louis XIII, which was subsequently converted into an asylum for aged and insane women. It consists of 45 huge buildings, having in the aggregate no less than 4,682 windows. There are 8,000 inmates. It is associated with the reform brought about in the treatment of the insane by Philippe Pinel, whose statue stands in the Place in front. There is a similar home for aged and infirm men at Bicêtre, and there are numerous institutions for the care of children and for the treatment of special diseases. The number of patients annually received and cared for in the hospitals amounts to about 50,000 men and 40,000 women and 20,000 children. The average annual deaths are about 7,000 men, 5,000 women and 3,000 children. The Assistance Publique expends annually about 40,000,000 francs on these hospitals and other allied charities.

The Hotel des Invalides.— This great institution was founded in 1670 by Louis XIV as an asylum for his aged and disabled soldiers. With its high gilded dome, under which are the tombs of Napoleon, Turenne, Vauban, Jerome and Joseph Bonaparte and Marshal MacMahon, it is one of the most conspicuous monuments of Paris. The buildings, which cover about 30 acres, were begun in 1671 and completed in 1675. They furnish accommodation for 6,000 inmates. The façade of this vast structure is 660 feet in length. It stands about 600 yards back from the Seine, facing the Esplanade des Invalides, a fine open place about 900 feet wide, containing several rows of trees and extending to the river opposite the Champs Elysées. Close by is the Military School (*Ecole Militaire*), another great block of buildings covering 26 acres, the façade of the main building being about a quarter of a mile long. It was founded by Louis XV in 1751. There are about 500 students, the greater part of the establishment being now used as a caserne. It faces the Champ de Mars — another great open square, 1,100 yards in length and 550 yards in width, extending to the river, opposite the Trocadéro — which was originally designed for military manœuvres, and was the site of many imposing ceremonies and pageants during and immediately after the Revolution. The Tour Eiffel is built on the end next the river. It is a full 1,000 feet high (1,062 feet to the very top), being thus the tallest monument ever erected, nearly twice as high as the monument at Washington, and more than twice as high as the Great Pyramid. Commencing in 1867, some of the buildings of the International Expositions have been built on the Champ de Mars. It has, however, recently been condemned and is to be laid out in streets and built up in the near future. The Ministry of Foreign Affairs, one of the handsomest government buildings in Paris, adjoins it on the east along the Quai d'Orsay.

The Cemeteries.— There are more than 20 cemeteries in Paris, but at present much the greater number of interments are made in the newer cemeteries without the walls. There are, however, but three within the city of any considerable size or of much general interest. The largest and finest is Père Lachaise (*Cimetière de l' Est*), situated prettily on a hill in the northeastern part of the city, commanding a fine view. It takes its name from Lachaise, the Jesuit confessor of Louis XIV, whose country seat formerly occupied the site. It dates only from 1804, and extends to but 110 acres, but it contains the graves and tombs of a great number of the most distinguished Frenchmen of the last 150 years. Many also of a much earlier date have been moved there, as, for example, the tombs even of Héloise and Abelard. It well repays a visit, and some careful study. Next in interest is the cemetery of Montmartre (*Cimetière du Nord*), situated in the northern part of town not far from the Church of the Sacré Cœur. The cemetery of Montparnasse (*Cimetière du Sud*), on the left bank, dating from 1824, is the third in interest of the Parisian burying grounds. It is not far from the Gare Montparnasse. The little cemetery of Picpus, near the Place de la Nation, in the garden of an ancient convent, contains the graves of many distinguished people of the Revolutionary epoch. It is of especial interest to Americans as containing the grave of Lafayette. These cemeteries are all much alike in appearance, and in general much resemble those of New Orleans, the greater part of the tombs being above ground. There is a crematorium at Père Lachaise — the only one in Paris — with a columbarium in the Italian style as a depository for the ashes of the persons cremated there.

The Fountains.— After Rome no city is richer in fountains than Paris. There are dozens of them throughout the city, many of which are veritable works of art, and quite entitled to mention in any attempt to present a general view of Paris. The two large and beautiful fountains in the Place de la Concorde, constructed in 1836, contribute very much to the brilliance of that finest of Parisian squares. They each consist of a round basin 53 feet in diameter, above which rise two smaller basins surmounted by a spout from which a jet of water rises 28 feet in the air. The lower basins are surrounded by tritons and nereids, holding dolphins, which spout water into the second basins. The figures and the upper basins are bronze and the lower basins granite. These fountains produce a volume of spray, which under bright sunlight is superb. Two handsome modern fountains in granite ornament the Place du Theatre Français. Another of the great fountains is that of Saint Michel in the Place of the same name. It was constructed in 1860 and is 84 feet high and 48 feet wide, built into a wall. It consists of a niche in the form of a Roman triumphal arch containing a group of Saint Michael and the dragon in bronze mounted on a pile of rock, from which water gushes into three basins one above the other, flanked by bronze griffins of heroic size. At the sides of the niche are columns of red marble bearing bronze figures. The whole, though open to criticism in detail, constitutes a very imposing monument. The fountain of the Observatory, constructed in 1874, is a striking and original work, in the fine avenue of the Observatory with its six rows of forest trees. This fountain consists of eight sea horses, a group of four allegorical figures bearing an armillary sphere and water-spouting dolphins and tortoises. The basin is 60 feet in diameter and a great volume of water is discharged into a square reservoir below the basin, with a fine effect. The fountain of Saint Sulpice was erected in 1847 in front of the church of that name and consists of three concentric basins of stone one above the other and is embellished with statues of heroic size of the four most celebrated French preachers: Bossuet, Fénelon, Massilon and Fléchier. The volume of water is not great, but the fountain is a dignified and handsome ornament to the square. The fountain Molière, erected in 1844 to the memory of the famous dramatist, stands on the rue Richelieu near the house where he lived and died. It is 51 feet high and 21 feet wide, with a bronze statue of the poet flanked by the muses of serious and light comedy. Nearby in the same street in the small square Richelieu, facing the Bibliòtheque Nationale, is the fountain Richelieu, in bronze, dedicated to the four great rivers of France. It stands on the site of the old Grand Opera, to wash away the stain of the assassination of the Duke de Berry in 1820, who met his death there, under very tragic circumstances. The fountain de Grenelle in the street of that name near the rue de Bac, erected in 1739, is one of the finest of the old fountains. It consists of a crescent 100 feet in diameter and 38 feet high, in the centre of which stands a small Ionic portico with an allegorical group in white marble representing the city of Paris with the Seine and the Marne. Alfred de Musset died in 1857 in the house in front of which the fountain is built. The two fountains in the Jardin du Luxembourg — the old fountain de Médicis and the new one in memory of Delacroix — the ancient fountain of the Innocents at the central markets, and the splendid fountain de la Victoire in the Place du Chatelet, erected in 1807 to commemorate the earlier victories of Napoleon, are each of them notable monuments. A mention of the wonderful fountains at Versailles (*«les grandes eaux»*) incomparably the finest in the world, completes the general view of the fountains of Paris.

The Seine and the Bridges.— No single feature gives to a visitor a stronger suggestion of the imperial splendor of Paris than the installation of the Seine. The river, which flows for a distance of between seven and eight miles through the city, is contained within high walls of the most massive masonry. On either side of the river from one end to the other there is a broad street, lined with trees, and next to the river on the quai is a sidewalk or pavement. Below the quais and near the level of the water are the ports, also of masonry, where boats can land and freight and passengers be received and discharged. The walks along these shaded quais, with the river on one side and the busy life of the street on the other, are among the most interesting promenades in Paris. The bookstalls on the quais have long been famous. Passenger steamboats (*bateaux mouches*) ply up and down the river, making stops every few blocks and affording an excellent service for a fare of two cents at all seasons of the year. The 33 bridges which cross the river within the fortifications are among the most attractive features of the city, several being imposing works of art. The viaduct bridge at Auteuil is a mile and a quarter long, constructed throughout of masonry, with several galleries for vehicles and foot passengers beneath the railway line, and consists of 234 cross arches. It is a structure of exceptional beauty. The most famous of the bridges is perhaps the Pont-Neuf, which spans the river across the lower end of the island of the City. It is one of the oldest of the bridges, having been first constructed across both arms of the Seine in 1578. On the island, half way across the bridge, rises the equestrian statue of Henry IV. More traffic passes over this bridge than any other bridge in Paris, and perhaps more than over any other bridge anywhere, except possibly the congested traffic over London bridge. The Pont-Alexandre III is the newest of the bridges and was one of the notable contributions of the Exhibition of 1900 to the adornment of the city. It is a single steel span crossing the river so as to connect the Champs Elysées and the Esplanade des Invalides, affording a direct passage from the Palace of the Elysée to the Hotel des Invalides. Other notable bridges are the Pont de la Concorde, which at the time of the destruction of the Bastille was paved with some of the stones of that famous prison; the Pont d'Austerlitz, a massive work of masonry, recently widened, which after the Pont-Neuf is the most traveled of the bridges, connecting the two great railway stations, the Gare de Lyon and the Gare d'Orléans; the Pont Notre-Dame and the Petit Pont, which cross the two arms of the river at the island of the City in the line of the rue Saint Jacques and the rue Saint Martin, being thus situated precisely at the places of the first Roman bridges that crossed the river; the Pont des Arts, which is the only bridge in Paris which is simply a foot bridge, connecting the Institute and the Louvre; the Pont au Change at the Chatelet and the Pont Saint-Michel at the Place of that name, which are beautiful specimens of the art of bridge building in stone. By means of locks and dams the river is kept at all stages of water at about the same height, the minimum depth being 10½ feet, so that boats of 800 tons burden can come to Paris from Havre. This, in connection with the extensive system of canals of northern France which centre in Paris, makes of the capital the second port of the country. It is equaled in tonnage only by Marseilles.

The Parks.— Paris is one of the most favored of cities in the matter of parks. Although necessarily within the fortifications the area of parks and open spaces is relatively limited, there are within and without the walls — but within easy distance — including Fontainebleau and Versailles, about 200,000 acres of public parks, of which 20,000 acres are within 30 minutes travel from the centre of the city. The Bois de Boulogne and the Bois de Vincennes are the two largest strictly urban parks, the former being the most thronged and fashionable park in the capital. It extends to upward of 2,250 acres and lies between the western fortifications and the Seine. It was laid out in 1852, and since that time it has become the promenade not only of all Paris, but of all Europe. It is most frequented between 3 and 5 o'clock on summer afternoons. There is also a morning hour from 9 to about 11, when many «smart» people drive and ride. The Hippodrome de Longchamps in the Bois de Boulogne is the principal race course in the neighborhood of Paris. Races take place there almost every day, in spring, summer and autumn. The *Grand Prix* is run on a Sunday at the beginning of June and is the greatest racing event of the year in Paris. The value of the stakes at the *Grand Prix* is usually between 350,000 and 400,000 francs. Thus in 1913 it was 359,757 francs, plus 20,000 francs to the breeder. In 1914 it was 358,000 francs plus the same 20,000 francs. This is the most valuable stake in the world. The Bois de Vincennes is on the other and less fashionable side of the city, and is not as frequented as the Bois de Boulogne. It is the forest in which Louis IX used to hunt and administer justice. It also contains about 2,250 acres. The other principal parks within the city are the Jardin du Luxembourg — a beautiful garden, in the Latin quarter, in the style of Le Notre; the Jardin des Plantes, dating from 1640 in the reign of Louis XIII, with its museums of natural history and zoology made famous by the labors of Cuvier and Buffon; the Champs Elysées, most famous of city promenades; the Parc Monceau, in an aristocratic quarter, anciently the property of the dukes of Orléans; the Parc de Montsouris, one of the most picturesque pleasure grounds in any city; the Parc des Buttes Chaumont, in a neglected quarter of the city, on the site of the ancient gallows or gibbet of Montfaucon, where from about 1273 until the Revolution an uncounted multitude of malefactors were hanged; and finally the Jardin du Palais Royal and the Jardin des Tuileries in the very heart of the town. The boulevards are lined with trees — some of the wider streets having four or more rows — and many gardens in the courts throughout the city contain fine clumps of trees, so that on a bird's-eye view, as from the top of the Tour Eiffel, Paris seems almost to be built in a forest. There are, within the fortifications, nearly 400,000 trees under municipal supervision.

The Exhibitions.— Chief among the annual exhibitions in Paris is of course the Salon. It is held in the spring in the Grand Palais and is the principal artistic event of the year. Ordinarily about 2,000 paintings and 1,000 pastels, water-colors, etc., are shown, in addition to the sculpture and the bronzes. It attracts artists and lovers and patrons of art from every part of the world. The Concours-Hippique, also held in the Grand Palais, is the Paris Horse Show. It dates from the early days of the Second Empire, and is the model upon which such shows elsewhere have been organized. It, too, is held in the spring. The agricultural show in the Galerie des Machines is what its name indicates — an exhibition of agricultural machinery, farm products, cattle and pedigree stock, horticultural productions, dairy products, poultry and wine. It is an annual fair. The culinary exhibition, which is held in midsummer in pavilions erected for the purpose in the gardens of the Tuileries, is a curious show, intended to promote competition and excellence among cooks and to stimulate effort in culinary matters. The *Foire au Pain d'Epice* (gingerbread fair) is held in the Place de la Nation for the four weeks following Easter. It is the fair of the common people, with side-shows and merry-go-rounds and the like. It attracts enormous crowds, and is an interesting sight for visitors. The automobile shows, which for several years have been held in the winter at the Grand Palais, are notable events for persons interested in that industry. They attract the haut monde or «tout Paris,» as the phrase is, and like the horse shows are almost as much social functions as exhibitions. International exhibitions have been held in Paris in 1855, 1867, 1878, 1889 and 1900; Paris may accordingly be said to be the home of the international Exhibition. In 1900 there were 50,860,000 admissions to the exhibition — an unparalleled attendance. A great general international exhibition in 1921 to celebrate the semi-centennial of the republic has been proposed.

The Monuments.— First, perhaps, among the monuments that adorn the city is the Arc de Triomphe de l'Etoile, which stands in the spacious Place de l'Etoile, on an eminence at the head of the avenue des Champs Elysées. From this arc radiate 12 great avenues, like the spokes of a wheel, chief among which, after the avenue des Champs Elysées, are the avenue du Bois de Boulogne, leading to the park, and the avenue de la Grande Armée leading to Neuilly. This famous monument is the largest triumphal arch in existence. Its height is 160 feet, its width 146 feet and its depth 72 feet. The names of 172 victories of Napoleon and of 386 of his generals are carved into the arc, which consists of a main arch 67 feet high and 46 feet wide, intersected at right angles by a lower transversal arch. The work was begun by Napoleon in 1806 and finished by Louis Philippe in 1836. It is adorned with colossal trophies 36 feet high, with figures 16 feet high, its cost having been about 2,000,000 francs.

The Arc de Triomphe du Carrousel in the gardens of the Tuileries, built by Napoleon to commemorate his victories of 1805 and 1806, in imitation of the Arch of Severus at Rome, and formerly the chief entrance to the Palace of the Tuileries, is a notable structure. It was originally crowned with the celebrated Quadriga from the portal of Saint Mark's in Venice. Somewhat similar to these in general character are the Porte Saint Martin, in the grand boulevard — a triumphal arch 57 feet in height, erected in 1674 in honor of Louis XIV; and the Porte Saint Denis, another triumphal arch near by in the same thoroughfare, consisting of a single archway, 81 feet in height, built to commemorate the victories of the grand monarch in the Low Country. These two monuments are all that remain of the wall of Louis XIV, which was pulled down by Louis XV to make place for the grand boulevard.

The tomb of Napoleon under the dome des Invalides is a magnificent mausoleum, the tomb itself consisting of a sarcophagus of reddish-brown granite from Finland, weighing 67 tons, and being 13 feet long, 6½ feet wide and 14½ feet high. With its superb setting under the fine dome, it constitutes a most impressive memorial.

The Pantheon is in some respects the most imposing public edifice in Paris. It stands on the highest ground on the left bank on the site of the tomb of Sainte Geneviève, the patron saint of Paris. It was built by Louis XV (1764–90) from plans by Soufflot, and was designed to be the church of Sainte Geneviève. But in 1791 the Convention converted it into a sort of memorial temple, naming it the Pantheon, and inscribing on its front the words: «*Aux grands hommes la patrie reconnaissante.*» It is of most imposing appearance and dimensions, in form a Greek cross with equal arms, 370 feet long and 276 feet wide, surmounted by a dome 272 feet high and more than 75 feet in diameter, the lantern at the top of which is reached by a staircase of 425 steps. A huge colonnade consisting of 22 fluted Corinthian columns 81 feet in height, resembling that of the Pantheon at Rome, forms the portico, to which 11 steps ascend. The tympanum, 117 feet long and 23 feet high, contains a fine group of sculpture by David d'Angers. Mirabeau was buried here in the spring of 1791; shortly afterward Marat, Voltaire and Rousseau, and more recently Victor Hugo and President Carnot. The bodies of Voltaire and Rousseau were removed at the Restoration. The vaults also contain a considerable number of tombs of distinguished officers and soldiers of the Revolutionary period. The government is slowly decorating the interior with works of the best contemporary artists.

The Palais du Trocadéro, on the elevation in Passy, opposite the Champ de Mars, upon which Napoleon planned to erect a palace for the king of Rome, is a huge building in the oriental style. It consists of a circular edifice 190 feet in diameter and 180 feet high, surmounted by a dome and flanked by two minarets 270 feet high. On each side extend wings, 660 feet each in length, the whole in the form of a crescent. The main building contains a Salle des fêtes with an immense organ, and has seats for 6,000 persons. This is the largest auditorium in Paris. The palace contains important museums of comparative sculpture and ethnography.

Mention ought also to be made of the Palais Royal with its garden, built and owned originally by Richelieu (1629–34), where he lived at the end of his life and where he died in 1642, but it was thereafter long the property of the dukes of Orleans. The cafés and gardens of the palace were, during the Revolution, the rendezvous of democrats and malcontents generally. It was here that Camille Desmoulins called the populace to arms in July 1789. It is now government property and the seat of the *Conseil d'Etat.* A proposition has been made on behalf of some American merchants to convert a part of the arcades surrounding the garden into a great American department store, or general magazine for the exploitation of American goods, wares and merchandise. The Palace of the Order of the Legion of Honor, instituted by Napoleon in 1802, is situated on the Quai d'Orsay, at the corner of the rue Solférino. It was burned in 1871 by the Commune, but has been handsomely rebuilt. The original building was erected in 1786, and was interesting as the scene of Mme. de Staël's reunions during the Directory.

The Column Vendome, 142 feet high and 13 feet in diameter, constructed from German cannon captured in the Napoleonic wars, surmounted by the bronze statue of Napoleon as a Roman emperor, stands in the centre of the Place Vendome. It is one of the conspicuous monuments of the city. The column of July in the Place de la Bastille, erected by Louis Philippe, in 1831, celebrates the heroes who fell in the Revolution of 1830. It is 154 feet high and affords from its top a fine view of that part of the city, particularly of the cemetery of Père-Lachaise.

Other conspicuous monuments are the statue of the republic in the Place de la République, and the equestrial statues of Louis XIV in the Place de la Victoire, of Etienne Marcel at the Hotel de Ville, of Washington in the Place d'Iéna, of Joan of Arc — two, one opposite the Church of Saint Augustin and the other in the Place de Rivoli — and of Charlemagne in the Parvis de Notre Dame. The monuments of Gambetta at the Louvre, of Danton in the boulevard Saint Germain, of Molière in the rue Richelieu, of Shakespeare in the boulevard Haussmann, of Marshal Ney near the Observatoire, of La Fontaine in Passy, of Dante at the College de France, of Voltaire on the quai at the Institute, are among the many fine monuments that adorn the city. There are in all according to a recent official report 188 statues of men and women and 3,758 public clocks in Paris. If the statues of men and women in the parks and cemeteries are included, the total is more than 250. One monument of particular interest to Americans is the reduced copy of Bartholdi's «Liberty Enlightening the World» in bronze, on the Pont de Grenelle, presented to the city by the American colony in Paris, which has carved on its base simply the two great republican dates, «1776–1789.»

Theatres and the Opera.— The leading theatre of France is the Théâtre Français — «the house of Molière,» as Frenchmen affectionately call it. It was founded in 1600 at the hotel de Bourgogne in the Marais, and was under the superintendence of Molière from 1658 down to his death in 1673. The present house in the rue Richelieu, adjacent to the Palais Royal, was built in 1782, after his death. The interior was destroyed by fire in 1900, but it was immediately restored and rebuilt (1,400 seats). It contains a valuable theatrical library, and many theatrical art treasures, notable among which is Houdon's famous statue of Voltaire in the foyer. This great theatre — perhaps the first playhouse in the world, in virtue of its history and what it has contributed to dramatic art in its three hundred and more years of existence — was given its present preeminence in 1680, when Louis XIV suppressed its rival, the theatre of the Marais, and consolidated the troupe of Molière which then still played at the hotel de Bourgogne, with the Theatre Guénégaud in the rue Mazarine, thus creating a single theatre for Paris and eliminating all competition. This became what is now the Théâtre Français, and has had a continued existence from that day to this. It was for a time at the end of the 17th century on the other side of the river near the Institute, where the rue de l'Ancienne Comédie still suggests its former establishment on the left bank. The Théâtre Français — sometimes also called La Comédie Française — stands, however, second in official priority to the Grand Opéra, which is now the first play house in Paris. The opera house, a sumptuous edifice, bearing the inscription, «*Académie Nationale de Musique,*» standing at the head of the avenue de l'Opéra, was commenced in 1861 and completed in 1874. It occupies a site prepared especially for it just off the grand boulevard, covering an area of nearly three acres. Although it is much the largest theatre building in the world, it is third among the great theatres in point of seating capacity, coming after La Scala at Milan and San Carlo at Naples. It seats 2,200 persons. The site alone cost more than $2,000,000, and the building about 60,000,000 francs. It has an annual subvention from the government of 800,000 francs. No description can adequately convey a proper notion of the magnificence of the building and of its lavish decoration. The Opéra Comique, dating from 1761, which was destroyed by fire in 1887, has been splendidly rebuilt (1,500 seats), and stands next to the Grand Opéra in the amount of its subvention. It receives 300,000 francs annually from the government. The Odéon (1,420 seats), dating from 1782, on the left bank, near the Luxembourg, ranks in some respects next to the Théâtre Français, and is devoted chiefly to the performance of classical dramas. It is par excellence the theatre of the Latin quarter. The four theatres just mentioned are the subventioned theatres, each receiving from the state a substantial annual subscription. They are consequently open the year round, except for a short time in midsummer. The Grand Opéra and the Odéon give gratuitous performances two or three times a year, in recognition of their public character. Other leading theatres are the Chatelet (3,400 seats), the largest theatre in Paris, dating from 1780, and devoted now mainly to spectacular plays, for which its large stage especially adapts it; the Gaite (2,000 seats), dating from 1753, which affects light opera; the Vaudeville (1,100 seats), dating from 1792, a handsome theatre in the boulevard des Capucines, the character of which is fairly indicated by its name; the Théâtre Sarah Bernhardt (1,699 seats) in the Place du Chatelet, conducted by Madame Bernhardt; the Folies Dramatiques (1,600 seats), dating from 1831; the Antoine (1,000 seats), a new theatre that is attracting a good class of patronage by the uniformly high character of its productions; the Ambigu-Comique (1,500 seats), dating from 1769; and the Palais Royal (850 seats), an attractive little theatre dating from 1789, are each of them well-known places of amusement. There are in all in Paris about 40 theatres of the first class, besides a great number of secondary playhouses. Such institutions as the Moulin-Rouge, the Folies-Bergère, the Casino de Paris, the Olympia, the Concerts Rouge, the Concerts Colonne, the Nouveau Cirque, the Ambassadeurs and the Jardin de Paris have a world-wide reputation, while places like the Bal Bullier, the Bal Tabarin, the Palais de Glace, the Hippodrome, and all the rest of the cafés-concerts and cabarets artistiques *et id omne genus,* are not less known and appreciated by *Paris qui s'amuse.*

The Restaurants, Hotels and Street Life. — Paris is the home of high culinary art, and many of the famous restaurants, such as the Maison Dorée (like Tortoni, Hardy, the Café Anglais and Durand, now only a memory), Paillard, Café de Paris, Café de la Paix, the Ritz, Voisin, Ciro, Marguery, Foyot, Tour d'Argent (dating from 1582, and thus possibly the oldest of restaurants), and des Ambassadeurs have a world-wide reputation among *bon vivants.* Paris is also the city par excellence of hotels. No city has so many of them. The tendency is to small hotels, many of which maintain the highest standards of culinary excellence, and cater for a very critical clientèle Nowhere does one take his ease at his inn more perfectly — nowhere is he more absolutely *chez lui* — than in one of the countless *little* hotels of Paris. Among the great hotels, the Grand with its 1,000 rooms and superb location at the Place de l'Opéra, is pre-eminent. Other large hotels of the first class are the Ritz and the Bristol in the Place Vendome, the Elysée Palace in the avenue des Champs Elysées, the Continental in the rue de Rivoli facing the gardens of the Tuileries, the Terminus at the Gare Saint Lazare, the Regina, the Meurice, the Astoria, the Carleton, the Grand Hotel du Louvre near the Palais Royal, the Moderne in the Place de la République, the Scribe and the Mercedes at the Place de l'Etoile. Scarcely anything more impresses the visitor to Paris than the brightness and brilliance of the streets. They are kept scrupulously clean, and the wide asphalt sidewalks give opportunity for a life in the streets that is particularly pleasing. The cafés and restaurants set little tables in two or three rows on the sidewalks in front of their establishments under awnings, at which at almost all seasons of the year many thousands of persons daily are entertained either for their meals or for the aperitif which all Parisians seem to take in the late afternoon. Whenever the weather is mild these seats and tables in the streets are occupied by a well-ordered throng until well after midnight, eating, drinking, smoking, reading, writing, chatting and hearing the music. In consequence of this fashion of outdoor life the streets of Paris are especially brilliant. The plan and arrangement of the streets throughout the city, their width and the careful regulation of the traffic, facilitate easy and rapid transit, and consequently — in spite of the density of the traffic — they seldom seem exceptionally crowded. There is almost never a «block» in the movement of vehicles in the streets, although through the grand boulevard and at certain corners elsewhere the traffic is much the densest in the world.

The Markets and Abattoirs.— The central markets, the cattle markets, the wine markets and the abattoirs, which supply Paris with food and drink, furnish some interesting statistics. The markets (*Halles Centrales*), of which the name and the location date from the foundation by Philippe Auguste in the 13th century, are vast structures, chiefly of iron, erected in 1874, consisting of 12 pavilions, between which run covered streets, 48 feet wide and 48 feet high, intersected by a boulevard 105 feet wide. The six pavilions on either side of the boulevard occupy a space of 182 by 136 yards, the whole market covering an area of 22 acres. Each pavilion contains 250 stalls, and under each of the pavilions are cellars of similar area. It is estimated that 15,000 vehicles are employed in and about the markets in the traffic incident to the business. In spite of their extent they have become quite inadequate and the municipal council has now in hand a project for enlarging them by condemning the property to the east as far as the boulevard de Sébastopol, consisting of four blocks, for the erection of an extension. In each arrondissement, there are, in addition to these central markets, one or more local markets of the same general character, under municipal control. The cattle market (*Marché de la Villette*), near the fortifications on the rue d'Allemagne, consists of three large pavilions, covering an area of 10 acres. The central hall is capable of containing 4,600 oxen, the one on the right about 7,000 calves and pigs and the one on the left 22,000 sheep. About 4,000,000 head of cattle annually enter the market. Nearby and adjoining the cattle market are the slaughter-houses (*Abattoirs de la Villette*), the buildings of which include 20 courts with 250 scalding-pans. Both the markets and the slaughter-houses. which are kept exceedingly clean, are open at all times to the public. The cattle market and the abattoirs together have cost the city upward of 60,000,000 francs and well repay a visit.

Underground Paris.— The most distinctive feature of Paris underground are the sewers, which have for centuries been among the wonders of the capital. There were no covered sewers or drains in Paris prior to the reign of Louis XIII. Theretofore, there had been only open drains or gutters in the middle of the streets, such as may still be seen in some of the oldest streets of the French quarter in New Orleans, but about 1630 the present system was undertaken. It progressed at first but slowly, and only since about 1854 has it been efficient and relatively complete. It consists of an elaborate network of drains covering the entire area within the walls, constructed of stone and concrete in the most substantial manner, divided into 15 classes, from the great sewers of the first class, which are 18 feet and 2 inches in height by 11 feet and 4 inches wide, down to the little drains a few inches in diameter, that connect each individual house with the street drain. The discharge is carried by a tunnel far down the river below the city, where the liquid portion escapes into the river at Asnières, while the solid parts are collected and utilized as fertilizer in the peninsula of Gennevilliers. The city is divided, for drainage purposes, into four parts, by the two main sewers which run at right angles to the river under the boulevard de Sébastopol and the boulevard Saint Michel, respectively. These are discharged, not into the river, but into eight channels parallel with it, which in their turn receive the contents of 15 tributaries fed by numerous smaller drains. The total length of the network is in excess of 900 miles, a distance about equal to that from New York to Chicago, or a railway journey of 24 hours by fast express trains, and the system as a whole is without an equal anywhere. The cleaning of the sewers is effected by boats and scrapers and there is a siphon system at the Pont de l'Alma for conducting the drainage under the Seine. Excursions are made by curious visitors through some of the main sewers in electric boats and tram cars, which start periodically either from a point near the Madeleine or the Louvre, and go a distance of about five miles to the exit near the church of Saint Laurent in the rue Saint Martin or to the Place du Chatelet, or vice-versa. The sewers are utilized not only for sewage and drainage, but also as conduits for the water and gas pipes, for the pneumatic tubes that are used by the post office for the transmission of mail matter and for telephone and telegraph wires; they are perfectly ventilated and constantly patrolled by the men in charge of the service.

Below the sewers on the left bank are the Catacombs. They are the remains of ancient quarries, worked as far back as the Roman period, for the limestone of which Paris is built. They extend under a considerable part of the left bank. They were first used during the Revolution as depositories for bones and dead bodies removed from the cemetery of the Innocents, which was closed at that time. They have, therefore, been charnel-houses and known as catacombs only from that period. They are open to visitors periodically, the entrance being at the Place Denfert-Rochereau. They are extensive and rather curious, but very far from possessing the interest of the more famous catacombs of Rome, Naples and Syracuse.

The latest and most presently and practically important feature of underground Paris to the average man is the Metropolitan Underground Railway, which was opened in 1900. It consists of lines running in various directions throughout the city, especially of a main line through the centre of town east and west, from the Porte de Vincennes to the Porte Maillot, a distance of about seven miles, and another more northerly line from the Place de la Nation to the Bois de Boulogne, making a loop of about eight miles in length. There are many connecting branches touching the Place de l'Opéra and the railway stations, which bring the lines to practically every part of Paris. The fares are five cents first class and three cents second class for any distance. Automobile omnibuses, carrying 30 passengers and weighing but 5,600 kilos, are run in connection with the Metropolitan, constituting the lesser arteries of the system of intramural transit, of which the lines underground constitute the main arteries; the omnibus fare is by distance and varies from two cents second class for a short distance, to five cents for a first class for any distance. The 663 omnibuses (employing 10,700 horses), of which 418 were two-horse and 245 three-horse conveyances, have thus been superseded.

No description of Paris underground would be quite complete without mention of the new and splendid station of the Orleans Railway line on the Quai d'Orsay, and the tunnel that runs under the quais and next to the river connecting it with the main station, two miles distant, at the Quai d'Austerlitz. It is regarded as an almost perfect installation, and served as a model for the similar work in New York by the Pennsylvania Railroad Company. The canals which traverse Paris, some of them underground for long distances, for example, under the Place de la Bastille and through the boulevard Richard Lenoir, are interesting displays of engineering and building skill.

Bibliography.— Among the immense number of books, historical and illustrative, concerning Paris, the following, mainly French and American works, will be found especially valuable: care should generally be taken not to rely much on information from distinctively English sources — ‹Paris à travers les âges› (1875); Robida, ‹Paris à travers l'histoire›; Joanne, ‹Paris illustre› (1881); Labedolière, ‹Le Nouveau Paris› (1871); ‹Guide de Paris par les principaux Ecrivains et Artistes de la France› (1868); Martin, ‹The Stones of Paris› (1899); Haynie, ‹Paris Past and Present› (1902); Lansdale, ‹Paris, Its Sites, Monuments, and History› (1899 — an accurate and very readable work); Bayet, ‹Précis d'Histoire de l'Art›; Robinson, ‹Modern Civic Art› (1903); ‹Guide Pratique à travers le vieux Paris› (1903); ‹Memorable Paris Houses› (1888); ‹Paris and Its Story› (1904); Belloc, Hilaire, ‹Paris› (1904); Moriac, ‹Paris sous la Commune› (1871); Kaufmann, ‹Paris of Today› (1891); Bourdon, ‹Petite Histoire de Paris›; Hugo, Victor, ‹Paris,› ‹Les Misérables› and ‹Notre Dame de Paris›; Sue, Eugéne, ‹Mysteries of Paris; the ‹Opera of Louise›; Lacomb, ‹Bibliographie de Paris› (1886); Wolff, Jetta S., ‹The Story of the Paris Churches› (Oxford 1918). The Guides of Joanne to Paris and its environs (in French and English) are mines of accurate information.

Charles F. Beach,
American Lawyer in Paris.

PARIS, Canada, a town and port of entry of Brant County, Ontario, on Grand River, on the Grand Trunk Railway, the Lake Erie and Northern Railway, and the Canadian Pacific Railway. It is connected with Brantford (7 miles) and Galt (14 miles) by the Grand Valley Electric Railway. The town has seven churches, three public schools and a high school, a public library and three banks. It owns its lighting and water-supply systems; and is supplied for industrial purposes with natural gas, and electric power from Niagara Falls. It is a busy industrial centre with potteries, plaster mills, knitting mills, flour and cloth mills and oil refineries. It has a refrigerating plant, and makes needles and shells for munition works. In the neighborhood are extensive gypsum beds and brick clay. Pop. about 4,600.

PARIS, Ill., city, county-seat of Edgar County, on the Vandalia Line and the Cleveland, Cincinnati, Chicago and Saint Louis railroads; about 18 miles northwest of Terre Haute, Ind., and 110 miles east by south of Springfield. It was founded in 1825 and incorporated in 1849. It is in a productive farming section, in which wheat, corn and broom corn are cultivated extensively. The manufacture of brooms is a prominent industry. The streets are well kept and the city presents the appearance of fine homes of prosperous people. There are a children's home and a public library. The park has an area of 100 acres, about 70 of which is an artificial lake. In 1916 the commission form of government was adopted. The electric-light plant and waterworks are owned and operated by the city. Pop. 7,664.

PARIS, Ky., city, county-seat of Bourbon County, on a branch of the Licking River and on the Louisville and Nashville and Frankfort and Cincinnati railroads, about 20 miles northeast of Lexington. It was settled in 1784 and in 1862 was chartered as a city. It is in an agricultural section, in the «blue grass region.» The chief trade is in tobacco, grass seed, whisky, hemp and horses. The prominent public buildings are the courthouse, built in 1903, and the municipal buildings. There are public and parish schools and a library. The city owns the gas-plant. Pop. about 6,000.

PARIS, or PARIS HILL, Me., village and county-seat of Oxford County, about 50 miles northeast of Portland. It is situated at an elevation of 800 feet and has fine scenery. Nearby is Mount Mica, which is notable for the variety of its deposits of rare minerals, including beryl and tourmaline. Novelties in wood are manufactured here. Pop., township, 3,436.

PARIS, Tenn., city, county-seat of Henry County, on a branch of the West Sandy River, and on the Nashville, Chattanooga and Saint Louis, and the Louisville and Nashville railways, about 119 miles west of Nashville. It is in a fertile agricultural region, in which cotton and tobacco are the chief products, and has an extensive trade in grain, cotton, several kinds of tobacco and proprietary medicines. There are flour and lumber mills, and railroad repair shops in the town. Pop. over 4,000.

PARIS, Tex., city and county-seat of Lamar County, on the Texas and Pacific, the Saint Louis and San Francisco, the Gulf, Colorado and Santa Fé, and the Texas Midland railways. The town was founded in 1845. Its affairs are managed under a special charter, by a mayor and board of aldermen. The city has a well-equipped fire department and it owns the waterworks and sewerage system, the latter being on the Waring system and the sewage being disposed of on a sewerage farm. The Federal government has a fine courthouse and post-office building, and the county courthouse is an imposing granite structure. There are two telephone systems, an electric railway, and electric light and gas. The homes and business houses are nearly all owned by their occupants, and very little of the property is mortgaged. The city has a high school affiliated with the State University as one of its preparatory schools, and a private seminary for girls. The county and city jointly maintain a free hospital and the county poor farm. The electric railway maintains a park and summer theatre in the eastern suburbs. The lands surrounding Paris produce cotton, corn, oats, alfalfa, fruits and vegetables; while the industrial establishments comprise cottonseed-oil mills, flour mills, an iron foundry, candy factories, woodworking shops and mattress and broom factories. Pop. about 13,000.

PARIS, Declaration of. See DECLARATION OF PARIS.

PARIS, Treaties of. See PEACE TREATIES.

PARIS, University of. See PARIS.

PARIS BASIN, an oblong depression about 20,000 square miles in extent, in the Cretaceous rocks under and around Paris, filled in with richly fossiliferous Tertiary deposits. It was made famous by the palæontological investigations of Cuvier.

PARIS GREEN, a poisonous pigment, a vivid light green in color, extensively used to kill the potato-bug and the cotton-worm. It is an insoluble mixture of the double salts of the acetate and the arsenite of copper, and was at one time extensively used as a pigment, especially for wall paper.

PARISH (Low Latin, *parochia*), in ecclesiastical law, in England, a certain territory or «circuit of ground,» committed to the spiritual charge of one ecclesiastic having care of souls therein. The whole of England is divided into 10,000 parishes. Camden says that this division was made in England about the year 630. Others refer it to a decree of the council of Lateran held in 1179. A law of King Edgar, about 970, seems to confine the payment of tithes to the parish to which a person belonged; and so it has remained ever since, and nowadays a man's parish in England is that in which the poor rate is collected from him. In the United States the word parish does not mean the same thing as in England, nor does it mean the same thing in all the States. The legal importance of parishes in England depends upon the fact that the rector of each parish is entitled to certain dues collected within it. From the first settlement of the United States there have been everywhere associations and bodies corporate or organized for ecclesiastical purposes, and these have been generally called parishes. In New England they were originally the same as towns; that is, the persons composing a town, and acting as a town in civil and political matters, also acted as one body in religious or ecclesiastical matters; and the parish had therefore the same territorial limits as the town. Afterward, as the towns grew more populous, they were divided for ecclesiastical purposes into different parishes, which were still territorial and were contained within local limits. There are many such parishes now in most of the States. At length, however, as a diversity of religious sentiment became developed, all religious opinions standing on the same footing in law, parishes began to be formed of persons associated by similarity of religious sentiment and not mere nearness of residence, and therefore with little or no reference to their place of abode. These were called poll parishes, in distinction from territorial parishes. They are numerous everywhere, and in the large cities may be considered as having taken the place of territorial parishes, which are almost unknown there. In Louisiana, the word parish is used to designate a district separated and defined by local limitations for merely civil and political purposes.

PARISH REGISTER, The, by George Crabbe, is the most notable poem of the volume published by him in 1807, 22 years after the appearance of the last of the early group of his poems. In some respects, for example, in the use of heroic couplets and of conventional diction, as well as in the absence of the more charming and inspiring elements of poetry, it held by his earlier work, but it was marked by a comparatively new and extraordinarily effective power to paint with resolute realism the lives and characters of the humbler inhabitants of an English village. Though in verse, it was really a valuable contribution, at an important juncture, to English fiction, despite the somewhat mechanical fashion in which the simple tales and sketches were grouped under the heads of ‹Baptisms,› ‹Marriages› and ‹Burials.› With its flattering success Crabbe «found himself,» and he followed the thus revealed line of his genius — not without showing development — in such works as ‹The Borough› (1810) and ‹Tales of the Hall› (1819). Each of these has its partisans who would place their favorite above ‹The Parish Register,› but that seems sufficiently to reveal the essential Crabbe, and it has the advantage of being comparatively short. Hence for the reader who does not wish to remain unacquainted with the poet whom Byron — surely with ‹The Parish Register› in mind — considered to be

"Though Nature's sternest painter, yet the best,"

there can be little doubt that the earlier work, which cheered the deathbed of Fox, may be the more safely recommended, although in it Crabbe does not reach the height of his power as a painter of the landscape of the eastern coast or exhibit strikingly those qualities of mellowness that seem to have made ‹Tales of the Hall› delightful to Edward FitzGerald.

Upon the special excellencies of the poem there is little room, or need, to dwell. The introduction is admirable, especially in its pictures of the interiors of typical cottages. Of the tales, that dealing with the miller's daughter thrust out by her father, though conventional, is pathetic, yet not in such a moving fashion as the story of Phœbe Dawson, which particularly impressed Fox and in some memorable lines of description is perhaps inferior to no passage in Crabbe's later books. His humor, never his strong point, is seen in the Gardener who delights to give botanical names to his children and to impress his friends with his learning. Of the character sketches it is not rash to praise those of Andrew Collett, «the blind, fat landlord of the Old Crown Inn," the thrifty Widow Goe, the trinket-loving Catherine, and the "noble peasant," Isaac Ashford. Yet some may hold that Crabbe reaches the height of his power at the very close, where he makes old Dibble, the parish clerk, describe the rectors under whom he had served. For those who think Crabbe's conversations such as were never heard on earth, who are not interested in Sir Edward Archer, the "amorous knight" and the recalcitrant Fanny Price, "lovely and chaste," who object to stilted lines, the admirer of 'The Parish Register can afford little help, but he may confidently assure them that the poem will never lack admirers.

William P. Trent.

PARISH SCHOOL. See School.

PARISH SCHOOLS, Roman Catholic. A free school attached to a Roman Catholic parochial foundation in order to carry out the belief of the Roman Catholic Church that there should be a union of secular learning and religious training for a complete education. Experience having shown that the instruction received at home and at church is not adequate for the requisite religious training of the child, the parish school, wherein religious, moral and secular training shall be imparted, was instituted. Such schools have been in existence from the earliest ages, although the special form in which we know them at the present day has been a development of the 19th century.

The new Code of Canon Law, promulgated by Pope Benedict XV as the universal law of the Church, on 28 June 1917, clearly outlines the Catholic position on the education question as can be seen from the wording of the following Canons:

> "1113. Parents are bound by a most serious obligation to procure as far as possible the religious, moral, physical and civil education of their children and to provide also for their temporal welfare.
>
> "1372. 1. All the Faithful are to be brought up from childhood in such a way that not only nothing be taught them that is opposed to the Catholic religion and good morals, but so that religious and moral instruction hold the first place.
>
> "2. Not only parents but all who hold their place have the right and most serious duty to procure the Christian education of their children.
>
> "1373. Religious instruction must be given in the elementary schools, suitably to the age of the pupils.
>
> "1374. Catholic children must not attend non-Catholic, undenominational, or mixed schools, those namely that are also open to non-Catholics. It belongs exclusively to the Bishop of the locality to judge under what circumstances and with what precautions against the danger of perversion, attendance at these schools may be tolerated.
>
> "1375. The Church has the right to found not only elementary schools, but also secondary schools and schools for higher studies.
>
> "1379. If Catholic elementary and secondary schools do not exist, in accordance with Canon 1373, care must be taken, particularly by the Bishop of the place, that they be founded."

The parish school does not materially differ in method, organization or scope from the public schools under the direction of the civil authorities, except that it is controlled by the Roman Catholic diocesan officials and supported by the voluntary contributions of the Roman Catholic people, receiving no State aid.

Organization.— The schools are graded according to the customary primary, grammar and high school divisions of modern educational ideas. The teachers are mainly members of the religious orders instituted for the work of education, supplemented by lay assistants. The rector of the parish is the official director of

Roman Catholic Parish Schools in the United States, March, 1918

Archdioceses, Dioceses, Vicariates-Apostolic	Parishes with schools	Children attending	Archdioceses, Dioceses, Vicariates-Apostolic	Parishes with schools	Children attending	Archdioceses, Dioceses, Vicariates-Apostolic	Parishes with schools	Children attending
Baltimore	95	29,615	Denver	29	†7,706	Omaha	74	10,273
Boston	105	60,937	Des Moines	21	3,036	Peoria	76	13,600
Chicago	279	118,215	Detroit	102	44,436	Pittsburgh	180	61,496
Cincinnati	123	32,473	Duluth	11	3,373	Portland	53	16,470
Dubuque	94	15,412	El Paso	9	1,935	Providence	41	†21,027
Milwaukee	156	37,734	Erie	47	12,467	Richmond	29	4,759
New Orleans	92	22,293	Fall River	29	12,742	Rochester	62	22,983
New York	188	94,139	Fargo	22	†2,932	Rockford	31	5,723
Oregon City	38	†7,000	Ft. Wayne	95	21,248	Sacramento	11	†2,340
Philadelphia	180	82,064	Galveston	40	5,342	Saint Augustine	19	†3,147
Saint Louis	186	34,809	Grand Island	12	†1,596	Saint Cloud	33	6,789
Saint Paul	99	25,315	Grand Rapids	89	18,357	Saint Joseph	29	3,672
San Francisco	48	15,441	Great Falls	8	†1,400	Salt Lake	3	510
Santa Fé	26	†3,294	Green Bay	107	23,700	San Antonio	66	7,646
Albany	52	19,838	Harrisburg	44	10,837	Savannah	17	†3,807
Alexandria	18	1,943	Hartford	87	38,705	Scranton	83	20,764
Alton	66	10,569	Helena	19	†7,460	Seattle	29	5,002
Altoona	42	11,095	Indianapolis	119	19,093	Sioux City	65	8,801
Baker City	6	810	Kansas City	49	†7,568	Sioux Falls	31	4,829
Belleville	74	10,113	La Crosse	84	11,630	Spokane	15	1,858
Bismarck	11	2,387	Lead	6	736	Springfield	69	31.436
Boise	9	†1,435	Leavenworth	67	7,500	Superior	25	4,496
Brooklyn	114	74,241	Lincoln	25	†2,706	Syracuse	31	13,076
Buffalo	132	37,917	Little Rock	44	3,519	Toledo	76	16,721
Burlington	21	6,753	Louisville	81	14,190	Trenton	49	16,403
Charleston	8	758	Manchester	38	17,207	Tucson	7	†2,435
Cheyenne	2	†416	Marquette	26	†8,224	Wheeling	26	4,291
Cleveland	129	49,302	Mobile	36	†5,277	Wichita	46	3,773
Columbus	59	13,579				Wilmington	14	4,499
Concordia	33	4,676	Monterey-Los Angeles	43	8,082	Winona	40	6,415
Corpus Christi	32	†2,225	Nashville	25	4,129	North Carolina	16	984
Covington	42	7,729	Natchez	36	†5,318	Ruthenian-Greek	125	11,598
Crookston	8	1,161	Newark	131	61,394			
Dallas	33	†5,713	Ogdensburg	19	4,248	Total	5,748	1,593,407
Davenport	47	6,970	Oklahoma	40	†5,320			

† Including academies.

each school. There is a diocesan school board appointed by the bishop to look after the general welfare of the diocesan school system, and a special diocesan superintendent, a priest, who is charged with the immediate inspection of the schools and who is responsible for the progress and efficiency of the classes.

The course of studies is prescribed by the diocesan board, which also controls the teaching staff. In some dioceses these teachers hold State licenses to teach, or they must pass an examination equal to the requirements for such a license. In many schools in New York State the Regents' examinations are taken. Lay trustees have been appointed on some of the school boards, but this custom has not become general as yet. Normal schools for members of the teaching orders, training classes and all the formal details for the study of pedagogy have been instituted. A Catholic Educational Association was organized 14 July 1904. which holds an annual National Conference attended bv delegates from all over the country, the deliberations of which have done much to standardize the parish system of education, under the 40,000 teachers in the Catholic elementary and secondary schools. These teachers are drawn mainly from 85 distinct communities of the religious orders of men and women. of which about one-fifteenth are men. The elementary schools are almost entirely taught by women. The upkeep of these schools costs the Catholics of the United States they estimate about $12,000,000 a year. This does not include the original cost of the buildings or sites. All this is in addition to the ordinary taxes for State schools.

With the growth of the general educational impulse and the development of the public school system there was an insistence by the Roman Catholic Church authorities on an equal impetus for the free parochial school. It must be remembered always that this opposition was not against the public school *per se,* but against the system that divorces religion from education or the «national endowment of agnosticism» as it has been termed. In 1904 the official report showed 4,001 schools and 986,088 children in attendance. In 1910 the figures were 4,703 schools and 1,197,913 pupils. For official figures prepared by the authorities of each diocese for the Catholic Directory giving the standing of Catholic parish schools in the United States, March 1918, see table p. 321.

History.— Roman Catholic schools have existed in the United States from the earliest days of missionary effort. As early as 1598 they were in use in New Mexico and Florida and for English-speaking pupils in Maryland in 1636. As the church membership grew in numbers and influence after the Revolution the movement for the establishment of elementary schools took on new vigor. It can be traced best in the formal legislation of the church authorities on the subject. The first Provincial Council of the bishops of the United States, held at Baltimore, Md., in October 1829, expressed the wish that schools should be organized where youth may imbibe principles of faith and morality along with human knowledge. In the three Plenary, or National, councils of the American hierarchy held also in Baltimore, the first in 1852; the second in 1866 and the third in 1884, the legislation is specific on the subject. What was an exhortation in the first and a prayer in the second became a command, emphatic and imperative in the third. In the First Plenary Council the bishops were exhorted, in view of the evils which arose from the defective education of the youth, to have a school attached to every church in each diocese, and to provide for the same and for suitable teachers from the revenues of the parish. In the Second Plenary Council the decrees laid down that the first, and in fact the only, remedy for the terrible evils of religious indifference and of moral corruption would seem to be that in every diocese, each church should have its school in which the Roman Catholic youth should be trained in religion and good morals as well as in literature and the arts. In the Third Plenary Council, it was decreed that:

> "I. Wherever a parish school does not already exist, one must be built within two years from the promulgation of the decree, and maintained in perpetuity, unless the bishop on account of insuperable obstacles, consents to a delay.
>
> "II. Any priest, who, by culpable negligence, fails to erect and to maintain a school within that time, or who will not heed the repeated admonitions of the bishop, will be liable to removal from his church.
>
> "III. Any mission or parish which fails to assist the priest in erecting and maintaining a school to such an extent that owing to this negligence the school cannot exist, must be censured by the bishop, who will employ efficient and prudent means of obtaining the necessary support.
>
> "IV. All Catholic parents are obliged to send their children to parish schools, unless they provide for their Christian education either at home or in other Catholic schools, or else obtain permission for sufficient reason, approved by the bishop, and with due precaution and other remedies, to send their children to other schools. What constitutes a Catholic school is left to the judgment of the bishop."

Other laws to give force to these decrees enact that candidates for the priesthood during their seminary course shall receive special training with a view to the proper management of schools. Bishops are required to appoint a commission for the examination of all persons who shall apply for positions as teachers in the parish schools and to see that the schools be brought to that «state of efficiency and perfection which the honor of the Church, the interests of the pupil, temporal as well as eternal, and the generous loyalty of the laity, unquestionably demand and deserve.» The end to be kept in view is «that the parish schools may continue to grow stronger and more efficient and may prove to be a source of pride, of hope and of strength to the State no less than to the Church.»

As a consequence of this legislation parish schools are to be found in every centre throughout the land where the Roman Catholic congregation is numerous enough to support one.

The first schools in the United States were usually established under the auspices of some religious denomination. The first free parish school in New York was started by Saint Peter's parish, New York city, in March 1800. It is the oldest free school in the city, the first public school not having opened until May 1806. By subsequent act of the legislature, passed in 1806, Saint Peter's school was empowered to receive its due proportion of the taxes collected by the State for educational purposes. In the United States Catholic Directory 1845–49. it is stated, «There are common schools for both male and female children in most of the cities and towns of this diocese (Boston) having Catholic teachers. In Lowell they are supported at the public expense, but in all other places at the expense of the parents of the children, aided by collections in the churches.» Lowell was a centre that had attracted a large Irish Catholic population and at the annual town meeting in May 1830 a committee was named to consider the expediency of establishing a separate school for the benefit of this part of the population. This committee reported favorably on such a school in April 1831. Bishop Fenwick writing to Lowell from Boston 26 March 1831, said:

> "I see no impropriety in the Catholic school of your town receiving aid from the school fund, especially if the Catholics of Lowell have contributed their portion by the payment of taxes or otherwise toward the support of said fund. Common justice would entitle them to something out of it for the payment of their Master. But I really do not understand how, in this liberal country, it can be made a condition to their receiving anything that they, the Catholics, shall be in that case debarred from having a Catholic teacher, learning out of Catholic books and being taught the catechism of the Catholic Church. We can never accept such terms. . . . I would not give a straw for that species of education which is not accompanied with and based upon religion."

Under an arrangement then made with the Catholic pastor of Lowell, several schools were organized which were paid for out of the public taxes. They are spoken of in the State Board's report of 1851 as the outcome of a «wise and liberal policy,» but they lapsed after 16 years of trial with the rise of the Native American movement and its consequent religious disturbances. The first Roman Catholic school in Boston was opened in 1820 and taught by Ursuline nuns. The Rev. John Thayer collected money in Ireland to have the project carried out.

In New York City in 1841 the school question played an important part in the State election. The school funds in the city were then administered by a body known as the Public School Society. The Roman Catholics complained of unjust treatment at its hands and the agitation by them with Bishop Hughes at their head resulted in the formation of the present public school system of the city and the entire abolition of the old Public School Society. In his message to the legislature on 4 Jan. 1842, Governor Seward, presenting the subject of schools and the school fund to the legislature, favored the consideration of the denominational free schools in the distribution of the taxes for educational purposes. In this he followed the teachings of his old preceptor, the famous Rev. Dr. Eliphalet Nott, president of Union College, who was asked by the governor to give him his views in writing on the subject that he might embody them in a message to the legislature. This he did and Governor Seward, in his message to the legislature 1 Jan. 1840, says:

> "The children of foreigners found in great numbers in our populous city and towns and in the vicinity of our public works are too often deprived of the advantages of our system of public education in consequence of prejudices arising from difference of language or religion. It ought never to be forgotten that the public welfare is as deeply concerned in their education as in that of our own children. I do not hesitate therefore to recommend the establishment of schools in which they may be instructed by teachers speaking the same language with themselves and professing the same faith. There would be no inequality in such a measure. Since it happens from the force of circumstances if not from choice that the responsibilities of education are in most instances confided by us to native citizens and occasions seldom offer a trial of our magnanimity by committing that trust to persons differing from ourselves in language or religion. Since we have opened our country and all its fullness to the oppressed of every nation we should evince wisdom equal to such generosity by qualifying their children for the high responsibilities of citizenship."

The establishment of the Department of Education practically as at present constituted in New York, did not materially alter the situation as far as the Roman Catholic view held it. Bishop Hughes put new energy into the establishment of free parish schools and the example of the Roman Catholic body in New York had an equally potent effect on other sections of the country. Attempts were subsequently made to bridge the difficulty of the heavy double school tax by compromise. One known as «the Poughkeepsie Plan,» was that of the pastor of Saint Peter's Church, Poughkeepsie, N. Y., who leased his schoolhouse to the local board of education at a nominal sum, the city authorities in return assuming all the expenses of running the school. No religious instruction was given during the regular school hours and the teachers were under the control of the local school board. Many Roman Catholics, lay and clerical, condemned this plan, but it was tolerated by the late Cardinal McCloskey, then archbishop of New York. This was in the early '70s of the last century. An adverse opinion by the superintendent of public instruction on the constitutionality of this plan caused its abandonment in 1899. The controversy reached its climax in 1891, when the Roman Catholics of the United States were divided into two opposing parties, or what might be called the strict constructionists and the liberals, over the question.

Some time before Archbishop Ireland had made an arrangement at two towns in his diocese, Faribault and Stillwater, by which the parish schools there received State money. This he described as follows:

> "The plan to which allusion here is made is most simple. It accords both with State laws and Church requirements and on this account commends itself to all fair minded, intelligent citizens. An existing Catholic school, which observation shows to be in all particulars fit to be put on a line with existing public schools, is adopted by the public school board and conducted during school hours under all the laws and regulations of the board as to teachers and pupils. The board is supreme in all that regards the imparting of the instruction required by its own programme and during all the time marked in this programme. In return the board pays the current expenses. No State money is paid out for sectarian instruction; there is no division of the school fund; there is not the slightest setting aside of State rights.
>
> There is on the other hand the serious advantage which all American citizens should appreciate — that Catholics have their children instructed under payments from the public fund to which they are contributors, together with their fellow citizens and the State has the satisfaction of bringing peaceably, and without violation of personal rights, under its direction, for the imparting of secular instruction, multitudes of Catholic children who otherwise must keep aloof from it.
>
> "The Catholic conscience is satisfied under the plan. For while secular instruction is imparted there is no danger from Protestant or agnostic bias of teachers' minds, and the legal school hours over, the buildings revert to Catholic control and religious instruction is given. Nothing more than this is marked in a formal letter from Rome, written in 1875, as needed in order that Catholic children may be authorized by bishops to attend State schools."

The opponents of this plan contended that the archbishop's advocacy of such a scheme unsettled the whole Roman Catholic position hitherto held on the education question. Complaint was made to Rome against him and he drew up a memorial defending his position, which was submitted to the Congregation of the Propaganda. The decision on the plan — «tolerari potest» (it can be tolerated) evoked further excitement. But the plan itself did not succeed owing to local secular opposition. The State superintendent of public instruction, Dr.

D. L. Kiehle (November 1891), said of it in regard to a ruling that the contract could not bind in any such conditions as that of retaining religious teachers:

> "A board of education cannot legally bind itself to follow any religious criterion in its choice of teachers, nor is it allowed to classify children according to their religion." And he adds that in case "the presence of the sisters in the school displeases a certain class of persons, or the habit they wear had a significance which was not acceptable, the board had the right of inviting them to dress like other teachers or else to withdraw."

The contract was therefore not renewed after the first year.

In the decade 1907–17 there was a special development of high schools and academies in conjunction with the parish schools, the latest statistics showing 600 such high schools for boys and 580 for girls. Another move was the organization of schools for the use of foreign-born immigrant children or their native-born brethren with parents from some of the 98 different countries and the 66 different languages that figure in our immigrant statistics. Just before the German War stopped immigration Prof. Herbert F. Wright of the Catholic University made a study of this educational problem and secured these statistics of Catholic parish schools thus engaged in the process of Americanizing their pupils:

			Teachers			
			Religious			
NATIONALITY	Number of schools	Enrolment	Women	Men	Lay	Total
Belgian......	4	1,233	38	..	1	39
Bohemian....	33	8;999	194	..	5	199
Dutch.......	1	205	4	..	..	4
Flemish......	2	80	2	..	2	4
French......	103	37,928	850	57	66	973
German......	424	125,792	2,985	96	52	3,133
Greek-Ruthenian.	32	3,042	6	..	41	47
Hungarian...	10	2,223	25	..	16	41
Italian.......	70	17,957	308	2	82	392
Lithuanian...	21	3,776	53	..	18	71
Polish.......	276	97,744	1,651	9	140	1,800
Portuguese...	1	215	4	..	..	4
Slavonian....	20	4,037	63	..	11	74
Slovak.......	34	9,764	157	..	20	177
Slovenian....	12	2,654	55	..	4	59
Spanish......	10	2,000	39	4	3	46
Syrian.......	2	148	2	1	2	5
Total....	1,055	317,797	6,436	169	463	7,068
Less 25 duplicates......	25	6,469	153	..	8	161
Total....	1,030	311,328	6,283	169	455	6,907

The average number of pupils in these schools was 300; and in each class 45. Of these pupils there were 3 per cent more girls than boys. Of the teachers 91 per cent were Sisters of religious orders; 2½ per cent priests or Brothers and 6½ per cent lay teachers. The Sisters predominate in the schools of all nationalities except Greek-Ruthenian, where all but 12½ per cent are lay teachers.

When the archbishops met in New York for their annual convocation on 16 Nov. 1892, Monsignor Satolli, the apostolic delegate, appeared before them and delivered a letter of instruction from the Pope which he had received from Rome, and which contained 13 propositions «For the settling of the school question and the giving of religious education.»

> "It is to be greatly desired," the instruction said, "and would be a most happy arrangement if the bishop agree with the civil authorities or with the members of the school board to conduct the school with mutual attention and consideration for their respective rights.
>
> "While there are teachers of any description for the secular branches who are legally inhibited from offending Catholic religion and morality — let the right and duty of the Church obtain of teaching the children catechism in order to remove danger to their faith and morals from any quarter whatsoever.
>
> "We further desire you to strive earnestly that the various local authorities firmly convinced that it is more conducive to the welfare of the commonwealth than religion should by wise legislation provide that the system of education, which is maintained at the public expense and to which therefore Catholics also contribute their share, be in no way prejudicial to their conscience or their religion. For we are persuaded that even your fellow citizens who differ from us in belief with their characteristic intelligence and prudence will readily set aside all suspicions and all views unfavorable to the Catholic church, and willingly acknowledge her merit as the one that dispelled the darkness of paganism by the light of the gospel and created a new society distinguished by the lustre of Christian virtues and by the cultivation of all that refines. We do not think that anyone hereafter looking into these things clearly will let Catholic parents be forced to erect and support schools which they can not use for the instruction of their children."

The controversy was finally and conclusively settled by a letter of Pope Leo XIII to the bishops of the United States, May 1893, instructing them to «steadfastly observe» the decrees of the Third Plenary Council of Baltimore in regard to parochial schools.

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THOMAS F. MEEHAN, A.M.

PARJANYA, pŭr-jŭn'yä, in the mythology of the Vedas, the rain god. He is associated with the thunder and the lightning and like all the rain gods, is the promoter of vegetation. In a sense, he is a culture god. His wife was the earth (mother). Naturally, on account of the relation of the rain to the other elements, Parjanya's name is often associated with the deities of the winds and the storms and with those of fire (as having its origin in the lightning). Three hymns are dedicated to him in the Rig-veda, in which he is mentioned some 30 times. Consult Macdonell, A. A., 'Vedic Mythology' (Strassburg 1897); 'History of Sanskrit Literature' (London 1913).

PARK, Edwards Amasa, American theologian: b. Providence, R. I., 29 Dec. 1808; d. Andover, Mass., 4 June 1900. He was graduated at Brown University in 1826, from Andover Theological Seminary in 1831 and was ordained pastor of the Congregationalist Church in Braintree, Mass., in the last-named year. He accepted the chair of moral and intellectual philosophy at Amherst in 1835 and in 1836 was appointed professor of moral and intellectual philosophy at Andover. From 1847–81 he held the chair of sacred rhetoric in that institution and thereafter until his death he was professor of theology there. He was very successful as a teacher and he made the study of systematic theology intensely interesting. He attempted to divest theology of its artificiality. He edited the *Bibliotheca Sacra* until 1884, various translations from the German and several memoirs. Among them 'Samuel Hopkins' (Boston 1854); 'Nathaniel Emmons' (Boston 1861); and wrote 'Discourses on Some Theological Doctrines as Related to the Religious Character' (1885). Consult 'Memorial Collection of Sermons' (Boston 1902), a memorial volume of his works in celebration of his 90th birthday (Boston 1898); Storrs, R. S., 'Memorial Address' (New York 1900).

PARK, Mungo, Scottish African explorer: b. near Selkirk, 10 Sept. 1771; d. Boussa, Africa, 1806. He studied medicine, and especially surgery, at Edinburgh University and in 1792 sailed for the East Indies as assistant medical officer on board the East Indiaman *Worcester*. He made some botanical studies in Sumatra, found there eight new species of fish; returned in 1793 and in 1795 was sent by the African Association to explore the course of the Niger. With but two attendants he proceeded up the Gambia and after extreme hardships reached Sego in 1796. He finally arrived at Falmouth in 1797 and in 1799 published his 'Travels in the Interior of Africa,' which went through three editions in that year and made the author famous. In 1803 he became leader of an expedition despatched by the government for African discovery and in 1805 set out with instructions to follow the course of the Niger «to the utmost possible distance to which it can be traced.» He set out with a party consisting of his brother-in-law, Anderson, 45 English soldiers and numerous natives. By the time they had reached the place where they were about to embark in canoes and float down the Niger to its mouth only seven of the whites were still alive. A few months later Anderson died. After having sailed over 1,000 miles in search of the mouth of the Niger and entered the rapids below Yuri, on the lower river, he ran into an ambush of the natives which lined both sides of the shore. In the attempt to escape Park and his three companions were drowned. He possessed the qualities of a great explorer and aroused British interest in African travels. Consult Memoir by E. Wishaw in Park's 'Journal of a Mission to the Interior of Africa' (1815); Maclachan, 'Life of Mungo Park.'

PARK, Roswell, American physician: b. Pomfret, Conn., 4 May 1852; d. 1914. He was educated at Racine College and Harvard, studied medicine at the Northwestern University, and was adjunct professor of anatomy there 1879–82. In 1883 he became professor of surgery at the University of Buffalo and later surgeon to the Buffalo General Hospital, and director of the State Pathological Laboratory (also in Buffalo). He was one of the attendants upon President McKinley after the latter was shot. He has published 'Lectures on Surgical Pathology' (1891); 'History of Medicine' (1897); 'Text-Book of Surgery'; 'Principles and Practices of Modern Surgery' (1907); 'Selected Papers, Surgical and Scientific' (1914).

PARK CITY, Utah, city in Summit County, on the Union Pacific and Utah Central railroads, 30 miles southeast of Salt Lake City. It is a silver mining region, with valuable mines in the vicinity and contains sampling works, quartz-mills, etc. Pop. over 5,000.

PARK COLLEGE, a coeducational institution founded at Parkville, Mo., in 1875 through the exertions of Col. G. F. Parks and Rev. J. A. MacAfee. There is an academy connected with the college which prepares students for the college course and there are excellent buildings, dormitories and equipment. The president in 1919 was F. W. Hawley and there were 450 students attending college and 103 with the colors. The number of instructors was 18. The endowment of the college amounts to about $500,000.

PARKE, John Grubb, American soldier: b. near Coatesville, Pa., 22 Sept. 1827; d. Washington, D. C., 16 Dec. 1900. He was graduated from West Point in 1849, assigned to the topographical engineering corps, and at the outbreak of the Civil War he was appointed brigadier-general of volunteers. He served under Burnside in North Carolina, was in command at the capture of Fort Macon, and in 1862 received promotion to the rank of major-general of volunteers. He was chief of staff of the Ninth corps at Antietam and South Mountain and served in that capacity under Burnside in the Army of the Potomac. He accompanied Sherman on his march to Vicksburg in command of the Ninth corps. In 1866 was retired from the volunteer service. He was in charge of the construction of fortifications in Maryland in 1867–68 and then became senior assistant in the office of engineers at Washington. He was promoted colonel of the corps of engineers in 1884 and in 1887 was appointed superintendent at West Point. He was retired at his own request in 1889. He published 'Compilations of Laws Relating to Public Works for the Improvement of Rivers and Harbors' (1877); 'Laws Relating to the Construction of Bridges over Navigable Waters' (1882).

PARKER, Alton Brooks, jurist: b. Cortland, N. Y., 14 May 1852. He was educated at the Cortland Normal School, taught school for a time and then began the study of law. He was graduated from the Albany Law School, was admitted to the bar and entered upon the practice of his profession at Kingston. In 1877 he was elected surrogate of Ulster County and in 1883 was re-elected. In 1884 he was a delegate to the Democratic National Convention and in 1885 President Cleveland offered him the office of First Assistant Postmaster-General, which, however, he declined. In 1885 he was chairman of the Democratic State Committee and in that same year was appointed a judge of the State Supreme Court to fill a vacancy, the next year being elected without opposition. In 1889 he was appointed to the Second Division of the Court of Appeals and when that court was dissolved was appointed a member of the General Term of the First Department, and in 1896 a member of the Appellate Division. In 1897 he was elected Chief Judge of the Court of Appeals of his State. He wrote many of the important decisions of the Court of Appeals and served until his resignation in 1904. During the period of his service on the bench he abstained from taking any active part in practical politics and it was only because the leaders respected his personal wish that he did not become the candidate for governor of his State upon the Democratic ticket in 1902. The chosen candidate of that year ran so close to victory that the party leaders complained to him that his reluctance to run had lost the election of the party which had made him chief judge of the State. They then drew from him the promise that should the party throughout the nation in 1904 call upon him to serve as its candidate for President he would put aside his personal wishes. Having obtained this promise, the party leaders at once began to pave the way for his nomination on the Democratic ticket for the presidency in 1904. Judge Parker, although taking no part in the advancement of this campaign, adhered to his promise and took no action to prevent the nomination as he had done in 1902. The efforts of the party leaders were successful and Judge Parker was nominated for the presidency by the Democratic Convention at Saint Louis 9 July 1904. Immediately after the receipt of the news of his nomination and of the contest which had occurred in the Convention over the money question plank in the platform, Judge Parker sent his famous "Gold Telegram" stating his position upon the money question and offering the Convention the opportunity before adjournment to substitute another candidate if dissatisfied with his position upon that question. The Convention reaffirmed the nomination of Judge Parker. The principal issue of the campaign arose upon Judge Parker's assertion of a heavy levy by the Republican Party upon the moneyed interests for campaign funds. He was defeated at the polls by Theodore Roosevelt. Judge Parker resigned from the Court of Appeals as soon as he and his associates could finish the writing of opinions in the undecided cases and before formally accepting the nomination of the Democratic Convention. After his defeat, Judge Parker went to New York City and in November 1904 opened an office and since that time has continued to practise law in New York City. He is one of the most prominent of the attorneys practising there and has handled many important cases. He appeared for the city of New York in its fight for 80-cent gas and was finally victorious in that case in the United States Supreme Court. He had charge of the litigation out of which grew the government suit against the Drug Trust under which it was dissolved in 1907 and also of the subsequent litigation as a result of which a large number of the New York wholesale houses who had been in the Trust, were compelled to pay heavy damages to the Parks firm in Cincinnati, which had been the principal foe of the Trust. He was counsel for Mayor McClellan throughout his fight against William R. Hearst, arising over the mayoralty election, in which Hearst sought to obtain a recount of the ballots. He was attorney for Samuel Gompers, John Mitchell and Frank Morrison in their great battle with Judge Silas Wright of Washington, in which the judge sought to punish the three labor leaders for contempt for an alleged violation of the court's injunction. In this case also Judge Parker was victorious in the United States Supreme Court. But the case was before that court twice and on the last appeal there was a reargument. Such leisure as his law practice allows is largely devoted to public matters. He was president of the American Bar Association in 1906. He was one of the organizers of the New York County Lawyers' Association and was its second president in 1909 and was re-elected for the two subsequent years. He was president of the New York State Bar Association in 1913 and 1914. He has presided at a number of Democratic State conventions and was the temporary chairman of the Democratic National Convention in 1912. He belongs to numerous organizations like the American Peace Society, the League to Enforce Peace, the National Security League, American Academy of Jurisprudence. The object of each of these various organizations is to promote some public good and Judge Parker unselfishly devotes his valuable time and labor to these causes and to many others.

PARKER, Arthur Caswell, American archæologist: b. Iroquois, N. Y., 1881. He was educated at Williamsport Dickinson Seminary and later studied anthropology under Prof. F. W. Putnam. He was special assistant archæologist at the American Museum of Natural History in 1901–02; field archæologist at the Peabody Museum in 1903; ethnologist of the New York State Department of Education in 1904–06; since when he has been archæologist of the New York State Museum. He edited the *American Indian Magazine*, the quarterly journal of the Society of American Indians, in 1913–16; and is author of 'Excavations in an Erie Indian Village' (1907); 'Iroquois Uses of Maize and other Food Plants' (1910); 'The Code of Handsome Lake, the Seneca Prophet' (1913); 'The Legal Status of the American Indians' (1915); 'The Constitution of the Five Nations' (1916), etc.

PARKER, Daniel, a Baptist innovator. See BAPTISTS, TWO-SEED-IN-THE-SPIRIT.

PARKER, Edward Harper, English Chinese scholar: b. 3 July 1849. He was educated at the Royal Institution School, Liverpool, and became a barrister of the Middle Temple. He intended to engage in the tea trade, studied Chinese, and as an interpreter traveled in Mongolia 1869–71. He was then in the consular service in various parts of the world (1871–95), and since 1901 has been professor of Chinese in Victoria University, Manchester, and reader in Chinese, University College, Liverpool, since 1896. He is the author of 'Comparative Chinese Family Law' (1879); 'The Opium War' (1887); 'China's Relations with Foreigners' (1888); 'Up the Yangtze' (1892); 'Burma' (1893); 'A Thousand Years of the Tartars' (1895); 'China' (1901); 'John Chinaman' (1901); 'China, Past and Present' (1903); 'China and Religion' (1905); 'Ancient China Simplified' (1908); 'Studies in Chinese Religion' (1910).

PARKER, Edwin Wallace, American Methodist Episcopal missionary bishop: b. Saint Johnsbury Vt., 21 Jan. 1833; d. Paini Tal, India, 4 June 1901. He was graduated at the General Biblical Institute, Concord, N. H., in 1857, and joined the Vermont Conference in that year. After two years' work as a pastor he was ordained deacon and elder under the missionary rule of the New England Conference and sailed for India, where he was stationed first in the district of Bijnor and afterward at Moradabad. On the organization of the India Conference in 1864 he became presiding elder, and in 1900 he was elected bishop of Southern Asia. Consult Messmore, J. H., 'Life of Edwin Wallace Parker' (1903).

PARKER, Foxhall Alexander, American naval officer: b. New York, 5 Aug. 1821; d. Annapolis, Md., 11 June 1879. He entered the navy as midshipman in 1839, was attached to the West Indian squadron, and later transferred to the Philadelphia naval school, where he was graduated in 1843. He served on the Great Lakes, the Mediterranean, the Pacific, and on various coast surveys until 1861, when he was appointed executive officer of the navy yard at Washington, D. C. His capable manipulation of the forces at his command after the battle of Bull Run in 1861 went far toward restoring order and Confidence at Washington. He performed excellent service throughout the War, receiving the rank of captain in 1866. He subsequently served on various commands, was raised to the rank of commodore in 1872, and was one of the founders of the Naval Institute at Annapolis in 1873. In 1877–78 he was in charge of the Boston navy yard, and in 1878, until his death, was superintendent of the Naval Academy at Annapolis. He published 'Fleet Tactics under Steam' (1863); 'Squadron Tactics under Steam' (1863); 'The Naval Howitzer Afloat' (1865); 'The Fleets of the World: the Galley Period' (1876); 'The Battle of Mobile Bay' (1878).

PARKER, Francis Wayland, American educator: b. Bedford, N. H., 9 Oct. 1837; d. 1902. He was educated in the public schools and taught until the outbreak of the Civil War, when he enlisted and served until its conclusion, rising to the rank of colonel of volunteers. He was again engaged in teaching until 1872, when he went to the University of Berlin for special study in pedagogy, philosophy and psychology. He was later superintendent of schools at Quincy, Mass., and at Boston, and was principal of the Normal School, Cook County, Ill. He wrote a number of textbooks, some of which ran into many editions. Among them are 'Talks on Teaching' (1883); 'The Practical Teacher' (1884); 'Course in Arithmetic' (1884); 'How to Teach Geography' (1885); 'How to Study Geography' (1889), etc.

PARKER, George Howard, American zoologist: b. Philadelphia, 23 Dec. 1864. He was graduated at Harvard in 1887, later pursuing special courses there and at the universities of Leipzig, Berlin and Freiburg. He became assistant instructor in zoology at Harvard in 1888 and occupied different positions there, becoming professor of zoology in 1906. He has made special investigations concerning the anatomy and physiology of sense organs and animal reactions and has contributed reports of them to the zoological periodicals. He was William Brewster Clark lecturer at Amherst College in 1914 and in that year was sent by the United States Government to investigate the Pribilof seal herd.

PARKER, Herschell Clifford, American physicist and explorer: b. Brooklyn, N. Y., 9 July 1867. He was graduated at the Columbia School of Mines in 1890, and was connected with the faculty there in 1891–1911, filling the chair of physics for some time before his resignation. He made explorations and first ascents in the Canadian Alps in 1897, 1899 and 1903; first ascents of the mountains Goodsir and Dawson in British Columbia, and of Hungabee, Deltaform, Biddle and Lefroy in Alberta, and explorations of the Mount McKinley region in Alaska in 1906, 1910 and 1912. He made the first ascent of the highest peak of Mount McKinley in 1912. Author of 'A Systematic Treatise on Electrical Measurements' (1897); and many contributions to scientific periodicals. He was one of the discoverers of "helium" and invented the "helioscope."

PARKER, Sir (Horatio) Gilbert, Canadian novelist: b. Camden East, Addington, Ontario, 23 Nov. 1862. He was educated at Trinity College, Toronto, in 1886 became associate editor of the Sydney (Australia) *Morning Herald,* and during his stay in Australia began to write plays. He traveled widely among the South Sea Islands and in northern Canada, and published a book of travel entitled 'Round the Compass in Australia' (1892). His novels include 'Pierre and His People: Tales of the Far North' (1892); 'Mrs. Falchion' (1893); 'The Trespasser' (1893); 'Translation of a Savage' (1894); 'The Trail of the Sword' (1895); 'When Valmond Came to Pontiac' (1895); 'An Adventurer of the North' (1895); 'The Seats of the Mighty' (1896), a romance of the taking of Quebec; 'The Stolen Bonds' (1897); 'The Pomp of the Lavilettes' (1897); 'The Battle of the Strong' (1898); 'The Lane that had no Turning' (1900); 'The Right of Way' (1901); 'Donovan Pasha' (1902); 'History of Old Quebec' (1903); 'A Ladder of Swords' (1904); 'The Weavers' (1907); 'Northern Lights' (1909); 'Cumner's Son' (1910); 'The Land of the People, and the State' (1910); 'The Judgment House' (1913); 'You Never Know Your Luck' (1915); 'The World in the Crucible' (1915); 'The Money Master' (1915); 'The World For Sale' (1916); 'Wild Youth and Another' (1919). His works of wide popularity exhibited a finished method and much skill in characterization and description. In 1900 and 1906 he was elected to Parliament in the Conservative interest for Gravesend, in 1902 was knighted and in 1915 was created a baronet.

PARKER, Horatio William, American musician and composer: b. Auburndale, Mass., 15 Sept. 1863. His education was for the most part European, and in 1885 he graduated from the Munich Royal Conservatory. After that time he was professor of music in the Cathedral School of Saint Paul, Garden City, L. I., and organist of Holy Trinity Church, New York, until 1893, when he became organist of Trinity Church, Boston. Since 1894 he has been professor of the theory of music at Yale University. His compositions rank high in American music; they include the oratorio 'Hora Novissima' (1893), the first American music given at an English musical festival; 'A Wanderer's Psalm' (1900), also given at one of the English festivals; the oratorio of 'Saint Christopher' (1896); the cantatas 'King Trojan' (1885); 'The Kobolds'; and 'Harold

Harfagar' (1891); 'The Dream King' (1893); 'A Star Song' (1901); 'The Leap of Roushan Bey' (1914). With Brian Hooker as librettist, in 1911 he won the Metropolitan Opera House $10,000 prize with the opera 'Mona,' and in 1915 the Los Angeles $10,000 prize with the opera 'Fairyland.' In 1915 he wrote the oratorio 'Morven and the Grail' for the centenary celebration of the Handel and Haydn Society of Boston. Among other compositions are symphonies, overtures, chamber music, pianoforte and organ numbers and numerous songs. In 1902 he received the degree of Mus. Doc. from Cambridge University.

PARKER, Sir Hyde, English admiral: b. Devonshire, England, 1739; d. 16 March 1807. He entered the British navy, served in the war of the American Revolution, where in 1776 he commanded a small squadron, and for services in the North River was knighted in 1779. He was promoted rear-admiral in 1793, vice-admiral in 1794, and appointed commander-in-chief at Jamaica in 1796. He returned to England in 1800, was given command of the Baltic fleet and moved northward to check the measures of the armed neutrality formed by Russia, Sweden and Denmark. In the battle of Copenhagen he had no share, it being an independent move of Nelson's, who was second in command and more daring than his commander. Parker compelled Sweden to remain inactive by his appearance before Carlskrona, and was preparing to move upon Cronstadt when the death of Emperor William ended hostilities. He was shortly afterward succeeded by Nelson, and thenceforward until his death lived in retirement.

PARKER, Joel, American Presbyterian clergyman and educator: b. Bethel, Vt., 27 Aug. 1799; d. New York, 2 May 1873. He was graduated at Hamilton in 1824, and after studying at the Auburn Theological Seminary was ordained in the Presbyterian Church. He was pastor at Rochester in 1826–30; organized the Dey Street Church in New York and was its pastor until 1832, when he went to a pastorate in New Orleans; and in 1838–40 he was in charge of the Tabernacle Presbyterian Church on Broadway, New York. Upon its being closed he became president of the Union Theological Seminary and occupied the chair of sacred rhetoric. He later held charges in Philadelphia in 1842–54, in New York at the Bleecker Street Presbyterian Church in 1854–63 and at Newark, N. J., in 1863–68. He was for a time associate editor of the *Presbyterian Quarterly Review* and was author of 'Lectures on Unitarianism' (1829); 'Reasonings of a Pastor' (1849); 'Pastor's Initiatory Catechism' (1855), etc.

PARKER, Joel, American statesman: b. Monmouth County, N. J., 24 Nov. 1816; d. Philadelphia, Pa., 2 Jan., 1888. He was graduated from Princeton in 1839, admitted to the bar in 1842 and established a law practice in Freehold, N. J. He engaged in politics with much zest, and in 1847 was elected to the New Jersey legislature; and in 1852–57 he was prosecuting attorney of Monmouth County. At the outbreak of the Civil War he was appointed major-general of volunteers and in 1862–66 was governor of New Jersey, giving loyal support to the policy of the national administration. He was again elected governor in 1870, and in 1880 was appointed associate justice of the Supreme Court of New Jersey, and reappointed in 1887.

PARKER, John Henry, English archæologist: b. London, 1 March 1806; d. Oxford, 31 Jan. 1884. He began his career as a bookseller in Oxford in 1832. Later he superintended many excavations in Rome, and was the author of 'The Archæology of Rome' (1874–84), a work of importance on the walls, aqueducts and tombs of the Eternal City. His other publications are a 'Glossary of Architecture' (1836), an important aid to the revival of Gothic art; 'Introduction to the Study of Gothic Architecture' (1849); 'The A B C of Gothic Architecture.'

PARKER, Joseph, English Congregational clergyman: b. Hexham-on-Tyne, Northumberland, 9 April 1830; d. London, 28 Nov. 1902. He studied at University College, London, in 1853 became pastor of the Congregational church at Banbury, and in 1858–69 was pastor of the Cavendish Street Church at Manchester. In 1869 he began his larger ministry at the old Poultry Chapel of London, the congregation of which was transferred in 1874 to the City Temple, Holburn Viaduct. He became one of the best-known preachers in England. His views were liberal, and he spoke with a ready command of vigorous English. In 1887 he visited the United States where he delivered an eulogy on Henry Ward Beecher, with whom he had been on very intimate terms. He was twice chairman of the Congregational Union of England and Wales, and published several works, including 'Ecce Deus' (1868); 'Springdale Abbey' (1869); 'The Paraclete' (1874); 'The People's Bible,' «discourses upon Holy Scripture, forming a pastoral commentary» (25 vols., 1885 et seq.); 'Tyne Chylde' (1883); 'Christian Profiles in a Pagan Mirror' (1898); and 'A Preacher's Life,' an autobiography (1899). Consult Adamson, William, 'Life of Joseph Parker' (New York 1903).

PARKER, Lawton S., American portrait painter: b. Fairfield, Mich., 7 April 1868. He studied at the École des Beaux Arts, Paris, and in 1892 was appointed professor of the Saint Louis School of Fine Arts. He became director of art at Beloit College in 1893, president of the New York School of Art in 1898–99, and of the Chicago School of Fine Arts in 1903. Among his sitters are Martin A. Ryerson, J. Ogden Armour, N. W. Harris, Harry P. Judson and Peter S. Grosscup, his portraits being marked by excellent characterization. He received the silver medal at the Saint Louis Exposition in 1904; gold medals at the International Exposition, Munich, in 1905, and at the Paris Salon in 1913; and was awarded the medal of honor at the Panama Exposition in 1915.

PARKER, Linus, American bishop of the Methodist Episcopal Church, South: b. Oneida County, (N.Y.?) 1829; d. New Orleans, La., 5 March 1885. He went to New Orleans when a youth and found employment, studying Latin, Greek and other branches in his leisure time, and at the age of 21 entered the Louisiana Conference. He was for four years a circuit rider, then becoming pastor of various churches in New Orleans and later presiding elder of his district. He edited the New Orleans *Christian Advocate* in 1870–82 and sat in the quadrennial sessions of the General Conference held during that time. He was elected bishop in 1882.

PARKER, Louis Napoleon, English dramatist and composer: b. Calados, France, 21 Oct. 1852. He was educated at Freiburg and the Royal Academy of Music, and was director of music in Sherborne School, Dorsetshire, 1877–96. In the latter year he removed to London and in 1898 was made a Fellow of the Royal Academy of Music. He is the author of many cantatas, such as ‘Silvia’ and the ‘Twenty-third Psalm,’ as well as many other musical compositions and of a large number of plays. Among the latter may be cited ‘Change Alley,’ and ‘The Man in the Street.’ He has also translated ‘Magda’; ‘L'Aiglon’; ‘Cyrano de Bergerac,’ and other dramas.

PARKER, Matthew, second Protestant archbishop of Canterbury: b. Norwich, 6 Aug. 1504; d. Canterbury, 17 May 1578. He entered Corpus Christi College, Cambridge, in 1522, and was graduated in 1525. Two years afterward he was ordained priest, and elected Fellow of his college. His favorite studies were the Scriptures, the church fathers and other ecclesiastical writers. In 1535 he was made chaplain to Queen Anne Boleyn, who shortly before her death commended to his care her daughter Elizabeth. This appointment carried with it the deanery of the College of Saint John the Baptist at Stoke-by-Clare, in Suffolk. He early imbibed Reformation principles and, in 1537, after the death of Anne Boleyn, Henry VIII made him one of his chaplains, and about five years afterward appointed him canon of Ely. In 1544 he was appointed to the mastership of Corpus Christi College, Cambridge, for which he compiled a new body of statutes; and in the following year was elected vice-chancellor of the university, and presented with the rectory of Land Beach. In 1547 he married Margaret Harlstone, the daughter of a Norfolkshire gentleman. In 1552 he was elected prebendary and afterward dean of Lincoln; but on the accession of Mary to the throne was stripped of these as well as his other preferments. A portion of his time he now spent in translating the Psalms into English verse. He also wrote a treatise, ‘De Conjugio Sacerdotum,’ defending the marriage of priests. When Elizabeth succeeded to the throne he was raised to the archbishopric of Canterbury, his consecration taking place 17 Dec. 1599. During his 15 years' primacy he labored to make clear the belief and discipline of the Church, and published his “Advertisements” for the regulation of divine service. In 1568 was published under his direction and his expense the Bishops' Bible, which was a revision of the text founded on Cranmer's translation; he was likewise prominently associated with those who drew up the Book of Common Prayer. He edited the histories of Matthew of Westminster, Matthew Paris and others; and had a considerable share in the work ‘De Antiquitate Britannicæ Ecclesiæ.’ Archbishop Parker was the founder of the Society of Antiquaries. His valuable collection of manuscripts relating to the civil and ecclesiastical history of England he presented to his own college at Cambridge and founded a number of valuable fellowships there. Consult ‘Life and Letters of Matthew Parker’ (Parker Society, 1853); Strype, ‘Life and Acts of Matthew Parker’ (1824); Hook, ‘Lives of the Archbishops of Canterbury’ (1872).

PARKER, Peter, American Congregationalist clergyman, physician and diplomat: b. Framingham, Mass., 18 June 1804; d. Washington, D. C., 10 Jan. 1888. He was graduated at Yale in 1831, took his M.D. there in 1834, and, having taken the theological course as well, was ordained in the ministry in that year and sent to China as a missionary. He established a hospital for diseases of the eye at Canton immediately after his arrival, but found other needs for medical attention so urgent that he admitted a wide variety of cases, 2,000 patients being cared for in the first year. He gained fame as a surgeon, acted in the capacity of a preacher, and also trained a number of natives in medicine and surgery. He closed his hospital during the war between China and England in 1840 and revisited the United States, but returned to China in 1842 and reopened the hospital, increasing its staff and capacity. He severed his connection with the American Board of Missions in 1845, and while retaining charge of the hospital acted as interpreter for the United States embassy, serving as chargé-d'affaires when the minister was absent. He returned to the United States for the benefit of his health in 1855, but in the same year accepted an appointment of the United States government as a commissioner to China, with power to revise the treaty of 1844. He remained in China in connection with this work in 1855–57 and then resigned. He was a regent of the Smithsonian Institute from 1868. Author of ‘Journal of an Expedition from Singapore to Japan’ (1838); ‘A Statement Respecting Hospitals in China’ (1841); ‘Notes of Surgical Practice Among the Chinese’ (1846), etc.

PARKER, Theodore, American clergyman and social reformer: b. Lexington, Mass., 24 Aug. 1810; d. Florence, Italy, 10 May 1860. He was the youngest of 11 children and received his early education at home. He took the arts course at Harvard, studying at home and visiting Cambridge for the examinations; and though he was unable thus to obtain a degree in course, that of M.A. was conferred upon him *honoris causa* in 1840. In 1834–36 he studied at the Cambridge Divinity School, and after preaching as a candidate was ordained 21 June 1837 and installed as pastor of the West Roxbury Unitarian Church. It was soon noised about that he was not in agreement with the Unitarian position of the time. His outspokenness had already won for him the reproach of “infidel,” and many of the Unitarian clergy had found exchanges of pulpit with him inconvenient before his discourse on ‘The Transient and Permanent in Christianity’ at the ordination of C. C. Shackford at South Boston, 19 May 1841. In this sermon Parker denied the special authority of the Bible, the supernatural origin of Christianity and the supernatural character and divine mission of Christ. It is perhaps not surprising that most pulpits were now closed against him, and that his name was associated with those of leaders of irreligion. His own congregation gave him steadfast support. He did not withdraw from the Unitarian Church, believing, apparently, that that Church was liberal enough to suffer a freedom of thought even so great as his; while the Church never formally expelled him from its ministry, being, it would seem, reluctant to afford him the prestige which might result from such action. But he was thenceforth actually an independent preacher. In 1846 he became pastor at Boston of what he always called the «Twenty-eighth Congregational Society.» Services were held until 1852 in the Melodeon, and in 1852–59 in the Music Hall, whose 3,000 seats were generally fully occupied. The regular membership was never large, but all shades of religious dissatisfaction there assembled, and many others were drawn by Parker's championship of humanitarian endeavors, especially of anti-slavery reform. In this cause «probably no one — not Garrison, not Phillips himself,» says Frothingham, «did more to awaken and enlighten the conscience of the North.» He was a leader in the committee of vigilance, received runaway slaves, fought the rendition of such and aided their escapes. For many years he was a popular lecturer, and to this activity gave much time. Both in the pulpit and on the platform he had none of the arts of the practised orator, but carried weight rather by his massive knowledge, deep conviction, frankness and vigorous and often picturesque English. Ill-health compelled the foreign sojourn during which he died. He was editor of the *Massachusetts Quarterly Review* in 1849–51, and wrote, besides sermons, several works, including ‹Historic Americans› (1870) and ‹Views of Religion› (1885), which have been collected by F. P. Cobbe (1870). For his peculiarly individual religious beliefs consult Clarke, ‹Parker and his Theology› (1859); and the ‹Lives› by Frothingham (1874) and Chadwick (1901); ‹The Works of Theodore Parker› (10 vols., Boston 1912).

PARKER, Willard, American surgeon: b. Hillsborough, N. H., 2 Sept. 1800; d. New York, 25 April 1884. He was graduated from Harvard in 1826, studied medicine and took his degree there in 1830, when he accepted a professorship in the Berkshire Medical College, Pittsfield, Mass. In 1836 he accepted the chair of surgery in the Cincinnati Medical College, but removed in 1839 to New York, where he had been appointed professor of surgery in the College of Physicians and Surgeons, which position he held for 30 years. He established a large practice in New York and as a surgeon he took high rank, making many advances in methods as well as important discoveries. He established the first college clinic in the United States at the College of Physicians and Surgeons in 1840; organized the New York Pathological Society in 1843; the New York Academy of Medicine in 1847, of which he was president for many years after 1856. From 1865 he was president of the State Inebriate Asylum at Binghamton, where his conduct of the management was very successful. He was consulting physician at the leading New York hospitals and connected with many medical organizations.

PARKER, William Belmont, American editor: b. Hasbury, England, 19 Sept. 1871. He came to the United States in early youth, was graduated at Harvard in 1897, and in 1898–1902 was assistant editor of the *Atlantic Monthly*. He was literary adviser to Houghton, Mifflin and Company, New York, in 1902–04; instructor in English at Harvard in 1904–05 and lecturer in that subject at Columbia in 1905–08. He was advisory editor of the *Associated Sunday Magazines* in 1906–08, and literary editor of the *World's Work* in 1908. He was editor and literary adviser to the Baker and Taylor Company in 1909–12, and literary adviser to the Century Company in 1912. He was business manager of the *Churchman* in 1912–14, and has been an editor with S. Pearson and Son since 1914. He edited Lowell's ‹Anti-Slavery Papers› (1903); Sir Philip Sidney's ‹Certaine Sonets› (1904); ‹Complete Poems of Edward Rowland Sill› (1906); ‹The Wisdom of Emerson› (1909); and was joint editor of ‹Letters and Addresses of Thomas Jefferson› (1905). Author of ‹Life of Edward Rowland Sill› (1915).

PARKER'S CROSS ROADS (Tenn.), Engagement at. On the morning of 11 Dec. 1862 Gen. N. B. Forrest, with about 2,500 cavalry, left Columbia, Tenn., to operate in the western part of the State and fall upon General Grant's communications with Columbus. On the 13th he reached the Tennessee River at Clifton, about 50 miles east of Jackson, crossed on a flatboat, and on the 16th reached Lexington, where he met 700 of the 11th Illinois Cavalry and two guns, under command of Col. R. G. Ingersoll, and routed Ingersoll, capturing him and nearly one-fourth of his command. Two detachments were now sent to cut the Mobile and Ohio Railroad at points north and south of Jackson, and on the 19th Forrest, with the remainder of his command, not over 600 men, moved on the town, and was met by a force of infantry and cavalry, which disputed his advance, but which was gradually driven back until within reach of the defenses of the place, when Forrest withdraw and, uniting his command, turned north on the line of the railroad. He captured Humboldt and Trenton, at the latter place taking and paroling its garrison of 700 men. Several small posts were captured and the railroad destroyed as far as the Kentucky line. On the 25th he retraced his steps toward the southeast, closely followed by General Sullivan with 4,000 men. On 31 December, at Parker's Cross Roads, a few miles north of Lexington, Sullivan's leading brigade of 1,500 men, under Col. C. L. Dunham, intercepted Forrest's march, but Forrest attacked it and drove it eastward and southward from the crossroads. The fighting lasted several hours, during which time Sullivan came up with Col. J. W. Fuller's brigade, and at 3 P.M. struck Forrest's rear and soon defeated him, taking 400 prisoners, six guns and several caissons and ammunition-wagons. The Union loss was 27 killed, 140 wounded and 70 missing. The Confederate loss in killed and wounded is not known. Forrest continued his retreat, brushed away the Sixth Tennessee Cavalry that had been sent to intercept him at Clifton, and 1 and 2 Jan. 1863 recrossed the Tennessee River, having destroyed the railroad at many points between Jackson and Columbus, also a large quantity of stores, and claiming that with a loss of less than 400 men he had killed, wounded and captured nearly 2,500. Consult

'Official Records' (Vol. XVII); Greene, 'The Mississippi'; The Century Company's 'Battles and Leaders of the Civil War' (Vol. III).

PARKERSBURG, pär'kėrz-bėrg, W. Va., city, county-seat of Wood County, on the Ohio River at the mouth of the Little Kanawha, and on the Baltimore and Ohio Southwestern, the Ohio River and the Baltimore and Ohio railroads, about 65 miles north of Charleston, the State capital, and 75 miles in direct line southwest of Wheeling. The city is connected by steamers with the river ports on the Ohio. It was settled in 1773; in 1820 was incorporated, and chartered as a city in 1863. Near by is the island where once lived Harman Blennerhassett (q.v.). It is in an agricultural region; in the vicinity are valuable clay and coal deposits, gas and petroleum wells and several mineral springs noted for their medicinal qualities. The chief industrial establishments are oil refineries, oil-well supply works, foundries, machine shops, flour and lumber mills, veneer works, furniture factories, shovels, clothing, glass, porcelain, shoes. It has an extensive trade in manufactured goods, farm products and coal. The prominent buildings are the city hospital, government building, city-hall, courthouse, some of the school buildings, Saint Joseph's Hospital, Masonic Temple, Y. M. C. A. The educational institutions are the Academy of the Visitation (R. C.), the new $400,000 high school, public and parish elementary schools and a public library. A new $450,000 passenger bridge spans the Ohio River connecting Belpre, Ohio, with Parkersburg. A railroad bridge, one and one-third miles long, crosses the Ohio. It was opened in 1871 and constructed at a cost of $1,000,000. Three fine bridges span the Little Kanawha. The location near the raw material, and the facilities for transportation combine to make Parkersburg an important manufacturing city. The city is governed on the commission plan since 1911. Pop. 23,000.

PARKES, pärks, **Elizabeth Robins** («C. E. RAIMOND,» «ELIZABETH ROBINS»), American author and actress: b. Louisville, Ky. She was married to G. R. Parkes, an actor, in 1885, and has spent much of her life in London, where she has appeared in several Ibsen rôles. She has published 'The Fatal Gift of Beauty and Other Stories'; 'George Mandeville's Husband'; 'The New Moon'; 'An Open Question'; 'The Magnetic North'; 'A Dark Lantern'; 'The Convert'; 'Under the Southern Cross'; 'Come and Find Me'; 'The Mills of the Gods'; 'The Florentine France'; 'My Little Sister'; 'Way Stations.'

PARKES, SIR **Harry Smith**, English diplomatist: b. Birchills Hall, near Walsall, Staffordshire, 24 Feb. 1828; d. Peking, China, 21 March 1885. He was orphaned at the age of five years, remaining under the care of an uncle and receiving his education at King Edward's grammar school. The death of his uncle caused him to go to China to make his home with a cousin at Macao, in 1841. He there began the study of the Chinese language and in 1842 he was appointed secretary and first interpreter to Sir Henry Pottinger, the British Plenipotentiary at Hongkong. Although then but 14 years of age he accompanied Sir Henry's expedition up the Yangtze-kiang to Nanking, took part in the capture of Chingkiang and the surrender of Nanking and was present at the signing of the peace treaty. He continued in the consular service, mastering the language and becoming an adept in dealing with the Chinese, and in 1854 he was appointed consul at Amoy. In 1855 he was secretary to the mission to Bangkok, where he took a leading part in concluding the first European treaty with Siam. He became acting consul at Canton in 1856, where he was brought into contact with Mandarin Yeh, whose open defiance of China's treaty obligations to England culminated in the seizure of the British ship *Arrow* and her crew, 8 Oct. 1856. Parkes immediately summoned the aid of the British governor of Hongkong and Admiral Sir M. Seymour was sent to his assistance. Canton was taken in December 1857 and Parkes became practically governor of the city, a position he held for nearly four years. He succeeded in restoring order in the city, revived trade, made it safe for foreigners to enter the city and did much to conciliate and win the confidence of the Chinese. While still engaged in this work in 1860 hostilities were renewed in the north and Parkes was ordered to the assistance of Lord Elgin. It was while acting as a commissioner to arrange a meeting between the British and Chinese authorities that Parkes and other British and French officers were taken prisoners by the Chinese, subjected to tortures and herded with the worst elements in the prison; they were confined there 11 days before they were removed to a Chinese temple. They were then informed that they were to be executed, but the sentence was suspended owing to the capture by the British of the Summer Palace. Parkes and his companion, Loch, were then permitted to return to the British lines but most of the other prisoners had died under the harsh treatment they received. In punishment for the treachery of the capture and the murderous severity with which the prisoners who died were treated, Lord Elgin burned the Summer Palace, which had previously been looted by the French. After accompanying the British embassy to its new residence in Peking, Parkes returned to his post in Canton where he remained until the city was restored to the Chinese in October 1861. He returned to England on leave of absence, was knighted in 1862 and in 1864 was sent to Shanghai as consul. In 1865 he was appointed Minister to Japan where for 18 years he not only ably served British interests but gave considerable assistance to the Japanese Liberals. He was transferred to Peking as British Minister there in 1882, and also became Minister to Korea with whom he concluded a satisfactory treaty. He succeeded in securing the immediate repudiation of the Chinese proclamation of 1884, by which all French residents might be poisoned, but died in the following year through overexertion incurred in the disturbances incident to the French attack upon Tongking. Consult Lane-Poole, 'Life' (2 vols., 1894).

PARKES, SIR **Henry**, Australian statesman: b. Stoneleigh, Warwickshire, 27 May 1815; d. 27 April 1896. His father was a farmer; the son became an ivory turner and in 1839 emigrated to Sydney. For several years his life was a hard struggle with poverty. He entered politics as a leader of the "anti-transportationists"; founded in 1849 *The Empire,* a liberal organ which he edited until 1857. In 1854 he was elected to the legislative council, in which he led the fight for responsible government, and he was a member of Parliament for East Sydney (1858–61), colonial secretary (1866–68), and again a member of the colonial parliament (1871), becoming Prime Minister of New South Wales in 1872. His cabinet remained in office until 1875, and he was again Prime Minister 1878–82 and 1887–89. He was a prominent adherent of the cause of Australian federation, insisted on democracy as the basis of any such scheme and successfully opposed Wentworth's plan of a bicameral legislature, with colonial peers in the upper House. He was a personal friend of Tennyson, and himself wrote several volumes of verse and prose; among the latter being ‘Australian Views of England’ (1869); ‘Federal Government in Australia’ (1890); ‘Fifty Years in the Making of Australian History’ (his autobiography, 1892); ‘An Emigrant's Home Letters’ (1897). Consult his political autobiography; Lyne, ‘Life of Sir Henry Parkes’ (London 1897); and an article by Marin La Meslée in *Revue des Deux Mondes* (1892, Tome III).

PARKESBURG, Pa., borough in Chester County, 44 miles west of Philadelphia, on the Pennsylvania Railroad. It is situated in a thriving agricultural region, and has iron and chemical works, and a flour mill. Pop. 2,522.

PARKHURST, pärk'hėrst, **Charles Henry,** American Presbyterian clergyman: b. Framingham, Mass., 17 April 1842. He was graduated at Amherst in 1866, studied theology at Halle 1869–70 and at Leipzig 1872–73, taught in Williston Seminary 1870–71, was pastor of the Congregational church of Lenox, Mass., 1874–80, and from the last named date was pastor of the Madison Square Presbyterian Church, New York, until its amalgamation with the First Presbyterian Church. His work as president of the Society for Prevention of Crime, notably his personal study at first hand of the problem of crime in New York, led to the famous Lexow investigation of the charge that the police were in league with metropolitan criminals. He wrote, besides some philological studies and various contributions to periodicals, ‘Forms of the Latin Verb illustrated by the Sanscrit’ (1870); ‘The Blind Man's Creed’ (1883); ‘The Pattern on the Mount’ (1885); ‘Three Gates on a Side’ (1887); ‘What Would the World be Without Religion?’ (1888); ‘The Swiss Guide’ (1889); ‘Our Fight with Tammany’ (1895); ‘The Sunny Side of Christianity’ (1901); ‘Talks to Young Men and to Young Women’ (1897); ‘Guarding the Cross with Krupp Guns’ (1900) and ‘A Little Lower than the Angels’ (1909).

PARKHURST, Howard Elmore, American musician and author: b. Ashland, Mass., 13 Sept. 1848. Beside various musical compositions he is the author of ‘The Birds' Calendar’ (1894); ‘Songbirds and Waterfowl’ (1897); ‘How to Name the Birds’ (1898); ‘Trees, Shrubs and Vines of Northeastern United States’ (1903); ‘A Complete System of Harmony’ (1908); ‘A Complete Method for the Organ’ (1911); ‘The Church Organist’ (1913); ‘The Beginnings of the World's Music’ (1914); ‘Rambler in Music Land’ (1914).

PARKIN, George Robert, Canadian educator and author: b. Salisbury, New Brunswick, 8 Feb. 1846. He was educated at the University of New Brunswick and at Oxford University, England. While at Oxford he was associated with a number of men who later became leaders in the imperialist movement in England, and Parkin is credited with influencing them to a considerable degree. He returned to Canada, and in 1874–89 he was principal of the College School, Fredericton, meantime continuing his connection with the imperialist cause. In 1889 he discontinued his lābors as a teacher in order to become a lecturer for the Imperial Federation League, in the interests of which he traveled throughout the empire. He became also Canadian correspondent for the London *Times,* laboring to secure a better acquaintance between Canada and England. He was principal of Upper Canada College, Toronto, in 1895–1902, continuing, however, his support of Imperialism. In 1902 he became organizer of the Rhodes Scholarship, and is considered in a large measure responsible for the successful execution of the plan. Author of ‘Reorganization of the British Empire’ (1882); Imperial Federation’ (1892); ‘Round the Empire’ (1892); ‘Life of Edward Thring’ (1897); ‘Life of Sir John Macdonald’ (1907); ‘The Rhodes Scholarships’ (1912).

PARKINSON, James, English physician and paleontologist: b. about 1755; d. London, 21 Dec. 1824. He was engaged in the practice of medicine at Hoxton in 1785, at which time he attended lectures on surgery given by John Hunter. He experienced some difficulties owing to his political activities and was the author of several publications on the affairs of his time. He made some valuable collections and notes on geology and paleontology; was a Fellow of the Royal College of Surgeons; and an original member of the Geological Society on its formation in 1807. He was author of numerous medical treatises but his most important works are ‘Organic Remains of a Former World’ (3 vols., 1808–11); ‘Outlines of Oryctology’ (1822).

PARKINSONIA, a genus of tropical trees and shrubs of the family *Cæsalpiniaceæ.* The species, of which there are less than 10, have short spines, bipinnate leaves, yellow or whitish flowers arranged in loose terminal or axillary racemes, and more or less twisted compressed pods. The best-known and most widely popular species is the Jerusalem thorn (*P. aculeata*). It is probably a native of America, but is cultivated throughout the tropics, in many parts of which it is naturalized. From its frequent employment for hedges and from its gorgeousness when in blossom it is often called the Barbados flower-fence. Its bark yields a white fibre which might be valuable for paper-making, but is rather weak and short for most purposes. It is fairly hardy in the Southern States and will thrive in the driest situations. As a greenhouse plant it is difficult to grow. *Parkinsonia torreyana* is a native of the Southwestern States where, like *P. microphylla,* it is known as "palo verde" from its green branches. Three species are natives of South America and one of South Africa.

Francis Parkman

PARKMAN, pärk'man, **Francis,** American historian: b. Boston, 16 Sept. 1823; d. there, 8 Nov. 1893. He prepared for college at Chauncey Hall School, in Boston, entered Harvard in 1840 and was graduated in 1844. During his college course he determined to write the history of the struggle between France and England for the possession of the New World, but kept his purpose a secret. In college he gave particular attention to history and literature, and attained considerable distinction as a historical student. On his vacation trips also he visited many of the localities of which he was afterward to write, and studied the life of the Indians of Maine. He kept diaries of all these excursions in which he recorded in detail his observations and impressions. After leaving Harvard he spent two years at the Law School but never entered upon the practice of law. Feeling the need for a fuller understanding of Indian character and life, he spent five months in the West, living among the Dakotas and other tribes. This gave him just the kind of first-hand knowledge he desired, but the hardships to which he was exposed undermined his constitution and brought upon him the weakness of the eyes and general ill health from which he suffered for the rest of his life. From that time he devoted himself to the completion of the work he had planned. He several times visited Canada and Europe, making a careful examination of the numerous manuscripts of the period concerning which he wrote and also studied closely life in several monasteries for the better comprehension of the spirit of monasticism and of Roman Catholic ecclesiasticism. From 1853 to 1863 his health prevented him from doing any historical work and at this time he gave his attention to horticulture, in which he was particularly successful; he wrote several valuable horticultural papers and 'The Book of Roses,' still a recognized authority. In 1868 he was overseer of Harvard, resigned this position in 1869 and became professor of horticulture; and in 1875–88 was a Fellow of Harvard. The courage and persistency with which he overcame the obstacles of ill health and ruined eyesight were truly heroic. Often he could work only a few minutes at a time; he had all documents and manuscripts read to him, taking as few notes as possible and dictated from his notes; yet he brought to full completion the great work he had planned. His first book, 'The Oregon Trail,' an account of his travels in the West, appeared in 1849; his one work of fiction, 'Vassall Morton,' in 1856. In 1851 he issued the 'Conspiracy of Pontiac,' and in 1865 'The Pioneers of France in the New World,' the first of the series 'France and England in North America.' The rest of the series appeared as follows: 'The Jesuits in North America' (1867); 'La Salle and the Discovery of the Great West' (1869); 'The Old Régime in Canada' (1874); 'Count Frontenac and New France under Louis XIV' (1877); 'Montcalm and Wolfe' (1884). This last concluded the series but left an important period untreated; the gap was filled by the publication of 'A Half Century of Conflict' (1892). Parkman chose for his subject a theme entirely untouched by other writers and dealt with it so successfully as to obtain pre-eminent rank among historians. His histories are not philosophical, yet are written with a breadth of view and a sense of proportion that mark the philosophic spirit. Nowhere does he show his power more clearly than in his sympathetic and vivid portrayal of many widely different characters. He combined to an unusual degree the merits of both the scientific and literary historian. None of the most scientific of modern historical students have surpassed him in thorough and exhaustive research, while his literary style is marked by a clearness, beauty and dramatic power that give to his histories the fascination of the best of romance. Consult Farnham, C. H., 'Life of Parkman' (Boston 1901); Sedgewick, H. D., 'Francis Parkman' (Boston 1904); Vedder, H. C., 'American Writers of Today' (New York 1910).

PARKS, Leighton, American Protestant Episcopal clergyman: b. New York, 10 Feb. 1852. He was graduated at the General Theological Seminary in 1876, was ordained deacon in that year and priest in 1877. He was rector of Emmanuel Church, Boston, in 1878–1904, since when he has held the charge of Saint Bartholomew's, New York, succeeding David H. Greer who resigned upon being elected bishop of the diocese. Author of 'His Star in the East'; 'The Winning of the Soul and Other Sermons' (1893); 'Moral Leadership and Other Sermons' (1914).

PARKS, Public. Cities as a rule are not sufficiently appreciative of the necessity and desirability of adequate park systems. They are usually satisfied with a few meagre, dust-covered squares, scattered throughout the business section, and certain large acreages in inaccessible locations, principally used for athletic and picnic parties. The park system of a city, however, necessarily receives the care and attention in its design and execution that is given to civic centres and other portions of the city. They are laid out in a broad spirit and with a free hand, and space should not be spared.

There is slight danger of planning parks on too large a scale, there having been few instances, if any, of cities having reduced the size of their parks, once laid out. At one time there was considerable criticism concerning the extent of Central Park in the city of New York, which is two and one-half miles long and one-half mile wide. To-day, however, the proposal to erect in it a building of the highest artistic character is vigorously opposed and public opinion would not countenance the slightest reduction in its area.

A modern system of a city is planned in a systematic manner. It should consist of parks of varying sizes and design, each adapted more or less particularly for certain purposes. In a general way, parks increase in size in proportion to the distance from the business centre, and for the purposes to which they are to be devoted they are grouped into four or five classes.

Those parks of the smallest size are generally located in the most congested parts of the city to relieve the pressure of business. They are not, however, so large as to have a disorganizing effect, or cause undue inconvenience to traffic and the dispatch of business. Those of the next largest size are, as a rule, in the crowded residential and tenement districts and they are of varying sizes, of from one to four blocks, or more, in area. Those of the third class are located in the outskirts of the residential portion and are usually of great extent. These are the principal parks of the city and are connected by boulevards and parkways. The fourth and largest class often consist of large undeveloped areas of land, purchased by the city and rented out partially for farming purposes and partially held as forests, from which the wood may be cut and sold in such quantities as will not deplete its growth. From lands such as these latter, cities in many European countries derive large and increasing revenues, while portions of the land may be sold from time to time as the city grows.

The number of parks in a city should be large, particularly as regards the smaller ones. An important principle in park design is to have the number and location such that every portion of the city shall be within easy walking distance of at least one small park. As to location, they should be arranged as a part of a system and not merely set down haphazard and wherever room may be had. They afford excellent terminal points for streets and avenues, and, when made a part of a proper system, add unity and variety to a city's plan.

The larger parks should be connected by boulevards, or, for the sake of variety, water communications, either for pleasure purposes or commercial use. If the waterways are for commercial use, they should be laid out with grass plots and lined with boulevards, as is the usual custom abroad.

The properties best adapted for park purposes are often of the least value for other uses. Steep hills, cliffs or rock formations, swamps, ponds, lakes and streams render land expensive for utilization as building sites, but, on the contrary, supply the natural features most easily transformed into interesting parks.

Small parks may be either of a strictly formal nature, or laid out on a more or less rural plan, with cascades, flower beds and an abundance of trees. Running water is always a feature of interest, but stagnant water should not be permitted, as being a breeding place for mosquitoes, which are likely to become a great nuisance.

Most large foreign cities are abundantly supplied with small parks. Berlin has a large number, as has Vienna, but in the latter city there is an arrangement known as the «Ring,» which adds to the effectiveness of the parks. Dresden and Stockholm also have a large number of small parks. In addition, in certain foreign cities, there are spacious squares, which, though devoid of grass, shrubbery or trees, still have to a certain extent the effect of parks, being embellished with fountains, obelisks, monuments, electroliers, etc. A well-known example of this latter is the Place de la Concorde, Paris, which, however, is bounded on two of its sides by parks; others are the Raadhus-Plads, Copenhagen, the eastern end of Unter den Linden in Berlin, the Dam in Amsterdam and the Place de l'Hôtel de Ville in Paris. Owing to the traffic passing through them, they are necessarily open.

If these open spaces are too large, they have the effect of dwarfing the surrounding buildings. Such is the case in certain squares found in Moscow and in Petrograd in the Place Dvortsory, the Place Krasnaia and the Place des Théâtres, which are merely large open spaces paved with cobblestones. While these spaces could have been laid out as parks with trees and grass plots, it may be that they have remained open as spaces for possible military parades.

One of the most important features of a park system is accessibility. The greatest attention should be paid to so arranging the parks and transportation lines that the public may be provided with quick, cheap and convenient means of access to the parks, for otherwise they lose the greater part of their usefulness.

Every city as a rule should have at least one large park within easy walking distance of a considerable part of its population and the other parks within easy reach by surface or other lines of transportation at a single fare. River and island parks are reached by bridges or by boats operated by the city. If transportation facilities to the parks are not ample the parks are of little use. The greater part of the city's population labors six days a week, with but few opportunities for recreation other than on the seventh day; much effort is being made to afford on that day all possible facilities for the needed recreation.

In character, the parks of a city should be varied; those of small size, surrounded by buildings of architectural interest, should be of a more formal character, that is, laid out on a more regular plan, with walks, terraces, avenues, lakes, fountains, flower beds, statuary, ornamental electroliers and other features of a similiar sort than those situated in more distant portions of the city. The latter are preferably of a more rural character, primæval and undisturbed in general effect. The main park of the city may partake of both these characteristics, portions being adapted to the one scheme and other portions to the other. In its appeal to its multitudinous users, they contain features calculated to appeal to the tastes of each and all seeking recreation.

The entrances to such a park have generally a monumental character and often have a central mall, laid out in a formal manner and flanked with statues. Promenades and walks, large flower beds, botanical gardens, zoological gardens, lakes with aquatic birds, facilities for rowing in summer and for ice skating in winter, artificial geysers, small streams and rivers with artificial falls, rock formations, bypaths, music stands, summer-houses, shelter-houses, drinking fountains, refreshment stands, concert pavilions, tennis and croquet grounds, wading pools for children, playgrounds with swings, carousels and the like, sun-dials, ornamental bridges, free singing birds, squirrels and other small animals, driveways, bridle paths, reservoirs, observation towers, decorative kiosks and other features all go to make such a park attractive to visitors of all classes. The foregoing indicates the arrangement and location of parks, while the following give some concrete examples of parks in certain representative cities. For example, the city of Berlin has been laid out and its development planned up to the year 2000, when, it is estimated, the city will have a population of 10,000,000. With 4,000,000 inhabitants at present, Berlin is the third largest city in the world. Before its suburbs —

the principle of which are Charlottenburg, Schoneburg, Rixdorf and Wilmersdorf — were incorporated in it, its population was 2,091,000, and the area of its parks was as follows:

Nine parks, covering 776 acres; 147 small decorative plots, 254 acres; three tree nurseries, 42 acres; one school garden, 74 acres; a total of 1,146 acres. In addition, the length of streets planted with trees is 106 miles. Around the trees are 262 garden plots having an aggregate area of 237 acres. There are also 99 acres of grass plots utilized as children's playgrounds, ranging in size from 1¼ to 17 acres each.

The park area of Charlottenburg (pop. 309,400) on 31 March 1912 was 618 acres. On the same date the total area of the city was 5,790 acres. In addition to its parks proper, the city maintains four tree nurseries in which 174,000 young trees were growing at the end of March 1912. At the same time the municipal greenhouses contain 87,885 flowering plants, 1,399 palms and 2,408 decorative plants, of an aggregate value of $10,460. During the course of the year 456,643 plants, worth $27,000, were used in the parks, in the street boulevarding and about the schools, hospitals, etc.

Berlin-Schoneburg possesses its own municipal gardens, covering 50,000 square yards, which, when entirely completed, will comprise 11 greenhouses, 125 hotbeds, a botanical section intended to supply schools with demonstrative specimens and a municipal free nursery. On the average, 300,000 plants, including about 50,000 bulbs, are used each year for setting out in the city flower beds. The park commission's budget for the fiscal year 1913–14 amounted to $72,195.

Great attention has been paid throughout Germany to the subject of parks, not alone within the cities, but also without, certain municipalities owning from 10,000 to 40,000 acres, which, considered from the standpoint of forest conservation, bring in a steady and ever-increasing income. In fact there are instances of certain cities, instead of collecting taxes, paying dividends to their citizens each year out of the proceeds derived from their lands and other municipal owned utilities.

Within Greater London the total park area is approximately 17,800 acres, of which the 17 government parks comprise 56,857 acres, the 13 city parks, 6,491 acres, in addition to the suburban parks, of 5,057 acres and the borough parks, of 266 acres. The principal parks are Victoria, with 250 acres, Battersea, 200 acres, Hempstead Heath, 250 acres. The last named is a high tract of land lying in the northwestern part of the city, with few artificial features. Besides these there are four royal parks, Saint James, Green, Kensington Gardens and Hyde Park, the best known being the last named, the rendezvous of high society and royalty, particularly during the spring and summer months. Kensington Gardens is a veritable arbor, trees, shrubs and flowers from every clime being found on every hand. Other parks are Putney Heath, Regent's Park, Richmond Park, on the Thames and the numerous small squares and open places, many being around churches. The total upkeep is approximately $600,000 per annum for the entire park system.

The parks of Paris are divided between those within and those without the fortifications, the latter being found in all directions at varying distances up to Forests of Fontainebleau, covering between 40,000 and 45,000 acres, which, although over an hour's ride from the city, is claimed with pride by every Parisian. Of the parks within the city, the most famous is that of the Tuileries (56 acres), overlooking the Seine on the right side, and, therefore, being on the line dividing the city. Formerly the grounds of the royal palace, the Tuileries have seen many vicissitudes. To-day they are the property of the French Republic, the only park in Paris so owned. At one end is situated the famous Paris art museum, the Louvre, and at the other, in the Place de la Concorde, is the beginning of the Champs Élysées, the famous parked boulevard extending northwesterly to the Arc de Triomphe. To the right is one of the fashionable shopping streets, the Rue de Rivoli. The arrangement of the park is rather formal, the embellishments, semi-classical sculpture, monuments, etc., being in keeping with the architecture of the palace of the Tuileries and the Louvre. Its central location makes it exceedingly popular, particularly for the working people employed in its vicinity.

Another park of the same size is the Luxemburg Gardens, situated around the palace of the Luxemburg. Less formal, and filled with many objects of historic interest, it is a favorite spot with the student population of the "left bank" of the Seine. Other interior parks are the aristocratic Parc Monceau (23 acres), filled with examples of the finest French sculpture and completely timbered; Montsouris Park (38 acres), with its meteorological observatory; Jardin des Plantes (58 acres), with its botanical treasures; and the Buttes-Chaumont Gardens (57 acres), formerly the gallows field of the city, reclaimed in 1865 for park purposes, has become one of the most attractive spots in the city.

Outside the fortifications is the Bois de Boulogne (2,100 acres), a natural wooded park with lakes, running streams, winding roadways and two race tracks. The Bois, as it is known, is the aristocratic afternoon park of the city, and here and on the Champs Élysées on the way to the Bois may be seen everyone who considers himself of any importance. On the opposite side of the city is the Bois de Vincennes, a similar park of the same size. While its natural features are much the same as the Bois de Boulogne, it is somewhat less accessible and less popular. There are two other parks, among the many that surround Paris, that have a particular attraction for visitors — those at Saint Cloud and at Versailles. Both were formerly the seats of French royalty. The latter, taken in connection with the palace, is a striking example of the geometrically formed park, which, if split in two in the centre and one-half superimposed over the other, is supposed to show an absolute bilateral similarity. It is divided by a Grand Canal. The principal attraction is the playing of the great fountains, which, on account of the great cost — upwards of $2,000 per day — takes place once a month during the summer, and, in addition, the numerous objects of historical and romantic interest, for it was here that the French court had its greatest splendor.

In the city of New York are many notable parks, the best known being Central Park (840 acres), situated in the practical geographical centre of the borough of Manhattan, New York City proper. It was purchased for park purposes, plans were worked out and development was begun between the years 1853 and 1863, work being begun in 1857. It extends from 59th to 110th street and from 5th to 8th avenues, and is situated conveniently to all the principal car lines of the city. It is wooded in part, with a large number of foreign trees and shrubs, and has a series of winding roads, paths and by-ways from one end to the other. Besides its natural features it has many additional attractions, for instance, a "Zoo," which is visited by thousands every year, a greenhouse wherein are exhibited splendid examples of exotic plants, and in which flower shows are sometimes held. A large lake, ponds and running streams are other of the attractions, and facilities for rowing in summer and skating in winter are provided. Of permanent value the year around as a place much visited is the Metropolitan Museum, situated on the 5th avenue side, and the American Museum of Natural History, located just outside on the western side. Two city water reservoirs, an obelisk, a Revolutionary fort, the "Mall," with its concert stand, and many monuments are other points of interest. It is cut by only one cross street (having a car line), but the street is below the surface of the park and properly bridged over.

The land included in Central Park cost originally $5,028,844. In 1906 its value was estimated at $236,500,000, and to-day it is worth probably over half a billion dollars — an example of the reason for which European cities make it a rule to buy parks and lands for speculative purposes.

Other parks are Pelham Bay Park (1,756 acres) with a shore front of upwards of 10 miles, along Long Island Sound, and two islands; Bronx Park (719 acres), containing the New York Botanical Gardens and the Zoological Park, the most important of its kind in the country. Bronx Park, with its natural woods and other features, including a river, spacious boulevards, etc., is a favorite spot with thousands of persons from the lower "East Side" of New York City, as the lines of communication run direct. Van Cortlandt Park (1,132 acres), on the Hudson River side of the city, is the favorite public recreation park of New York, particularly so for golf, track and other outdoor sports, including skating.

Brooklyn contains several notable parks: Prospect Park (516 acres), the site of the Revolutionary battle of Long Island. The effort of its sponsors has been to keep it as nearly in its natural condition as possible, and entire freedom is given to children to play in any part. In particular, it contains a "Parade" of about 40 acres for athletic sports; Dyker Island Park (144 acres), overlooking the Narrows; Bay Ridge Park, overlooking New York Bay; Forest Park (535 acres), adjoining Queensborough, filled with natural attractions for the lover of outdoor life; and Fort Greene Park (30 acres), around the site of the Revolutionary fort of the same name. In Staten Island is Silver Lake Park (300 acres), well laid out with drives, tennis courts, etc.

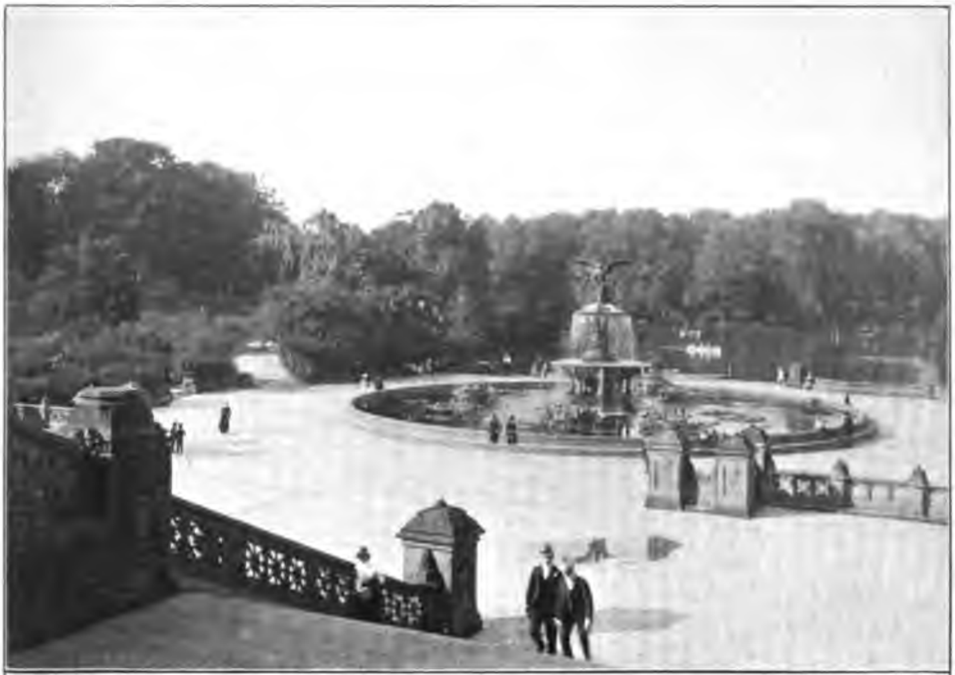
Both in New York and in Brooklyn are innumerable smaller parks — breathing spaces — and between certain of the parks are connecting boulevards of note, timbered and parked, from 200 to 400 feet in width. The most noted of these perhaps is Riverside Drive and Park, extending from 72d street northward along the Hudson River. It follows the natural contour of the littoral, and is flanked on one side by some of the handsomest residences and apartment-houses of the city, and on the other by the river bank with its primæval timber. Unfortunately, access to the water's edge is difficult, as the New York Central has the right of way, but plans are being formulated for the bridging over of the tracks so that park purposes may not be interfered with.

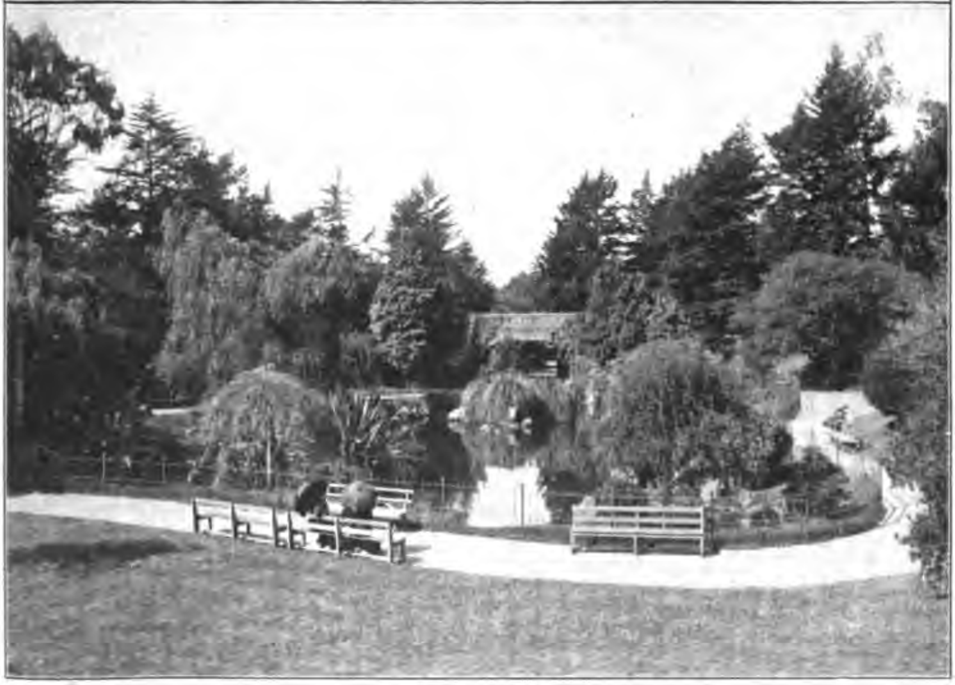
Philadelphia is well supplied with parks, the most beautiful being Fairmount (3,242 acres), and Wissahickon Driveway on the Schuylkill River. The city park commission in 1888 formulated plans for the systematic improvement and addition of the park system, so that now within a radius of 25 miles from the city hall there is an area of upwards of 8,500 acres devoted to this purpose, including open spaces, river fronts, boulevards, etc.

Boston has perhaps the most complete system of parks and playgrounds in America; in fact, the modern playground and recreation-park movement may fairly be said to have had its beginnings for Americans in Boston. The city stands at the head of those communities which have actually achieved their aims in this direction. There are within the city 3,574 acres of land devoted to park and playground purposes, over one-tenth of the total land area of the city. Of this area, 2,692 acres are under the control of the city and 882 acres under control of the State. The Common with an area of 48 acres, and the Public Garden, with an area of 24 acres, lie almost at the centre of the city. No district is without its park or playground, no part of the community without an easily accessible breathing spot. A State-appointed Metropolitan Park Commission has developed in the environs of the city a supplementary system of parks. North of the city lies the Middlesex Falls Reservation, containing over 3,000 acres of hills and woodland. To the south lies the Blue Hills Reservation of 4,232 acres. The banks of the Charles River and the ocean beaches are included in the general scheme and all the larger units are joined by means of a system of well-kept boulevards. Education features are provided at the Marine Park, the Franklin Park Zoo and the Arnold Arboretum.

Baltimore, 2,277 acres, the best known being Patterson Park, Carroll Park and Druid Hill; Chicago has a system whereby within 10 minutes walk one can find a park. In size they run from 3 to 75 acres. The best known are Lincoln Park, Washington Park and Jackson Park, the last named being the site of the World's Columbian Exposition, 1893. In general the lagoons for which the exposition was famed have been left, and are now a veritable network of waterways. The park commission of Chicago has endeavored to combine its parks with the idea of recreation, and probably the most nearly complete system in the country is the result. Washington, the Federal capital, has a well-developed park system, including Potomac Park, Lincoln Park, Meridian Hill Park, Logan Park, Garfield Park. The Military Park of Newark, N. J., is well developed

PARKS





1 The Fountain, Central Park, New York

2 Lake Alvord, Golden Gate Park, San Francisco

as also Battery Park of Charleston, S. C., Gordon Park, Cleveland, is becoming one of the show places of that city. Garden City, Long Island, and Forest Hills a few miles distant are among the most interesting modern civic developments in America from the point of view of the park and landscape architect. Akron, Ohio, has a fine public playground and rest spot in Perkins Park. Grant Park, Atlanta, Ga., has undergone considerable improvement and has many features of interest. Saint Augustine and Jacksonville, Fla., have very interesting parks with sub-tropical plants and trees of great interest to visitors from the bleak North. Belle Isle, Detroit, ranks among the best developed public parks in the United States and Washington Park, Albany, N. Y., is also among the best developed civic park areas. Seaside Park, Bridgeport, Conn., has great natural advantages, being located on the Atlantic shore; it has undergone considerable improvement in recent years and is among the more noteworthy developments in park design and maintenance. Keney Park and Elizabeth Park, Hartford, Conn., are noted for their scenic and floral beauty.

The foregoing are examples of parks for large cities. Smaller cities as a rule in the past have done comparatively little to provide parks and recreation grounds. However, with the introduction of modern city planning, numerous American cities are now providing park systems previously not dreamed of, for instance, in a comprehensive city planning report for Bethlehem, Pa. (65,000 population), plans were prepared for a chain of parks, boulevards and recreation grounds which may be considered adequate and serve as a good example for a city of this size. The several parks developed and now under development are, Monocacy Park, Sand Island Park and Lehigh River Park within the city limits, and Saucon Park just outside of the city limit but within the jurisdiction of the city planning commission.

Frank Koester,
Consulting Engineer and City Planning Expert; Author of ‘Modern City Planning and Maintenance.’

PARKSVILLE, Mo., village in Platte County, 10 miles northwest of Kansas City, on the Missouri River, and on the Chicago Great Western and the Chicago, Burlington and Quincy railroads. Park College was founded here in 1875. There are stone quarries and it is a shipping point for willows for riprapping. Pop. 765.

PARLEMENT, in French history, before the Revolution, a name applied to certain superior and final courts of judicature, in which also the edicts of the king were registered before they became laws. Of these the chief was that of Paris, but there were no fewer than 12 provincial parlements, at Toulouse, Grenoble, Bordeaux, Dijon, Pau, Metz, Besançon, Douai, Rouen, Aix, Rennes and Nancy. These, though not actually connected with that of Paris, invariably made common cause with it in its struggles with the royal power. Of these parlements the most celebrated, most influential and historically, most interesting, was that of Paris. It dates back to the Curia Regis of the Frankish kings. The former assembly was composed of the dignitaries of the court (lay and ecclesiastical), who were accustomed to meet at the call of the king and under his presidency, or that of some one appointed by him, to act for him. Thus, in its origin, the parlement of Paris was a distinctly royal council. As such it looked after all cases involving the royal interests. In addition to this it heard appeals from the lower courts, especially where denial of justice or unnecessary delay was charged. On account of its royal origin it became, especially under the Carolingian rulers, the court in which the higher nobility and those connected with the king's household were tried. Its functions were also extended, more broadly, to those living under the protection of the sovereign. These various functions threw upon the parlement an amount of work very much greater than had originally been intended it should have to perform. Gradually this work was systematized and divided into three distinctly defined sections, known as (1) Conseil de Roi; (2) Chambre des Comptes; and (3) the Parlement proper. Notwithstanding these divisions, the parlement continued to be composed of the nobility up to the reign of Louis IX, in the 13th century; but by this time the three divisions above indicated had become very definitely defined. In the reign of Philip IV (1285–1314) the upper bourgeoisie began to be represented in the parlement which already consisted of three chambers, the «Grand' Chambre,» or the meeting of the parlement as a whole; the «Chambre des enquêtes,» a sort of committee of the Grand' Chambre, which took charge of preliminary investigations of all kinds and handled a vast amount of detail work, which could more easily be taken care of by it than by the parlement as a whole; and finally the «Chambre des requêtes» which, as its name indicates, handled all petitions made to the parlement. During the occupation of Paris by the English (1417–36) the parlement of Paris continued to meet and transact its business regularly at Poitiers.

The French parlement can scarcely be called a parliament in the English sense of the word, because it never really ceased, theoretically at least, to represent the interests of the sovereign. The members were appointed by the king, sometimes on his own authority and to represent his own interests, but generally, especially from 1400 onward, from a list of eligibles presented by parlement. Thus no one could become a member of parlement who was displeasing to the king or who was known to oppose his interests. But gradually the principle of nomination became a dead letter and by the reign of Francis I membership in the parlement was openly purchased. This, combined with the fact that in the reign of Louis XI (1467) the irremovability of the members had become a fixed principle, tended to rapidly make of that body a «nobility of the robe,» which, as it grew in power, became excessively jealous of its own prerogatives and determined on strengthening its own position. Membership in the parlement began to pass from father to son as the order and rank of nobility. The sovereigns aided these pretensions by creating new members of parlement and collecting large sums from them for the favor of the appointment. In 1604 an arrangement was reached between the members of the parlement and the king whereby the former paid into the royal treasury one-sixtieth of their income in return for the royal confirmation of the principle that their parliamentary office should, at their death, pass to their heirs. The growth of power and importance of the parlement naturally soon began to make it look more to its own interests than to those of the sovereign. As early as the reign of Louis XI it began to endeavor to modify the royal decrees or to change or reject them, and the king's confirmation of the irremovability of the members was really a concession to their growing power and ability to oppose the royal will. From this time on a quiet struggle for power continued between the parlement on the one hand and the various sovereigns of France on the other, until finally in the reign of Louis XIII, the parlement sought to impose its will upon the king and upon his Minister, Richelieu, but failed in the attempt, thanks to the ability and determination of the latter. In the reign of Louis XIV the struggle was continued, and again the parlement finally lost out, and in the end found its powers greatly restricted, everything but its judiciary functions having been taken from it. This placed the parlement in the position of an antagonist attempting to gain from the Crown the powers and privileges of which it had been deprived. In 1771 the parlement was dissolved, all offices declared vacant and a new parlement created with restricted powers and emoluments. At this time provision was made for doing much of the judicial work of the parlement by the establishment of six superior courts, a really good and sound legal and legislative move, but one that was naturally very unpopular with the would-be ruling class, who composed the old parlement, and with the people as a whole, who sided with the members of the parlement rather than with the Crown, whose acts were considered arbitrary and illegal. This brought the parlement and the people closer together and tended continually to widen the breach between the former and the Crown. Thus the parlement, though in the beginning it had no object in opposing the sovereign other than the securing of its own individual interests, became logically the champion of popular rights and the will of the people as opposed to the autocratic power of its rulers, who were not slow to recognize the position into which the parlement had drifted. Rapidly the parlement became the emblem of widesweeping reforms in the government of the nation and the rights of the people. Had the parlement really been representative of popular interests it might have had a different influence on the history of popular rights in France; but it was all along bent on recovering its old privileges and powers and had little or no interest in the claims of the masses, which it bitterly opposed whenever any reforms were advocated that tended, in the interest of the general public, to restrict or curtail in any way its ancient privileges and emoluments. Finally, in 1790, the parlement of Paris and also all the provincial parlements were abolished by the National Assembly, who found that they were bent on looking after their own interests as privileged bodies, as opposed to those of the French people as a nation.

The chief importance of the parlements of France is to be found in the fact that they acted as practically national judiciary bodies at a time when the presence of such bodies was necessary for the safety of the nation. On account of their practical unity of aims and the close contact of the provincial parlements with that of Paris and with one another, they gradually unified the customs laws of France so that they obtained practically the force of one great body of written laws and laid the foundation of French law, which was built, for the most part, on justice and right.

Bibliography.—Aubert, 'Histoire du parlement de Paris, 1515' (1894); Bastard d'Estang, Vicomte de, 'Les parlements de France' (Paris 1857); Beugnot, 'Les Olim' (Paris 1839–48); Boutaric, 'Actes du parlement de Paris' (Paris 1863–67); Cherule, 'Dictionnaire historique des institutions, etc.' (Paris 1874); De Breuil, 'Stilus curie parlamenti' (Paris 1909); Esmein, 'Histoire du droit français' (Paris 1901); Flammermont, 'Remonstrances du parlement de Paris aux XVIIIe. siècle' (Paris 1888–98); Guilhiermoz, 'Enquêtes et procès' (Paris 1892); Langlois, 'Textes relatifs à l'histoire du parlement' (1888); 'Les origines du parlement' (Paris 1890); Luchaire, 'Histoire des institutions monarchique de la France' (Paris 1891); Viollet, 'Histoire des institutions politiques' (Paris 1903).

PARLER, or ARLER, Peter, German architect: b. probably Cologne, about 1333; d. about 1397. He was a son of Heinrich Parler, also a famous architect of Cologne, and brother to Johannes Parler, who in 1359 became master architect of the cathedral of Freiburg. The name is thought to be corrupted from Arler, and members of the family were known also as Von Gmünd, from the birthplace of Heinrich and others of the family connection. In 1356 Peter was architect on the Prague Cathedral, of which he is known to have built the choir. The members of the family are listed in Klemm's 'Allgemeine deutsche Biographie.' Consult also Neuwirth's 'Peter Parler von Gmünd und seine Familie' (Prague 1891).

PARLEY, Peter. See GOODRICH, SAMUEL GRISWOLD.

PARLEY, military term, designating an oral conference with the enemy. It takes place under a flag of truce and usually at some spot, temporarily neutral, between the lines of the opposing armies. The advance of the messenger is usually announced by sound of trumpet or beat of drum as well as by the signal of the white flag of truce. The messenger chosen is designated as a "parlementaire," a term used by all nations, including Great Britain and the United States. The parlementaire becomes the agent of all non-hostile intercourse between belligerent armies, his duties covering every form of communication between the opposing armies. He may be accompanied by three persons, usually a drummer, bugler or trumpeter and an interpreter. These persons, however, may not enter the enemy's lines; and the parlementaire may not demand reception by the commanding officer, but must, if requested, deliver his written message or put an oral message into writing to be delivered to the commander. The party advancing under a flag of truce is not to be fired upon, but on the other hand is supposed to select a quiet period and avoid recklessness in his advance, and if he advances under heavy enemy fire and is injured he has no cause for complaint; nor may a truce party advance at night. The party sending the parlementaire ceases firing as an announcement of sending a truce party, further announcement being made by «beating a parley» with trumpet or drum. The commander of the enemy army may not refuse to receive the message of the parlementaire, but he may declare formalities and conditions under which he will receive him and fix the hour and place at which he must appear. Unnecessary repetition of visits need not be permitted and in case of abuse of the white flag the commander in reprisal may refuse to receive the truce party. The parlementaire and his escort are inviolable except when he abuses his privileges in an effort to obtain information or other advantage. In such case he may be detained but word must be sent to his commanding officer and his detention must be of as brief duration as is consistent with safeguarding the secrets he has secured. The rules are clearly defined in the 'Rules of Land Warfare, Annex to Hague Convention No. iv, 18 Oct. 1907,' Consult 'Rules of Land Warfare, United States Army, 1914' (War Department, Washington 1914).

PARLIAMENT, Acts of. See Acts of Parliament; Great Britain — Parliament.

PARLIAMENT, British. See Great Britain — Parliament; London.

PARLIAMENT, Houses of. See London.

PARLIAMENTARY ELECTIONS ACT. See Corrupt Practices Acts.

PARLIAMENTARY LAW. See Law.

PARLIAMENTARY REFORM. See Great Britain.

PARLOA, pär-lō-ä, **Maria,** American author and domestic scientist: b. Massachusetts, 1843; d. 1909. She was an authority on the proper preparation of food and on household management upon which subjects she lectured and wrote extensively. She lectured to Harvard medical students on sickroom cooking, and she was special instructor on domestic science in various schools and colleges. After her return from Paris in 1881, where she had spent four years in study, she went through the western cities on a lecture tour which occupied several months, and she finally opened a cooking school in New York City in 1882. Among her works are 'First Principles of Household Management and Cookery' (1879); 'New Cook Book and Marketing Guide' (1882); 'The Kitchen Companion' (1887); 'The Young Housekeeper' (1894); 'Home Economics' (1898).

PARMA, pär'mä, **Alessandro Farnese,** 3d Duke of. See Farnese, Alessandro.

PARMA, Italy, the capital of the province of the same name, on the Parma, which divides the city into unequal parts; Parma is 55 miles by rail northwest of Bologna. The town is encircled by the Rampari, a promenade laid out on the site of the former fortifications. The old Roman Via Æmilia traverses the town centrally east to west, forming the principal street, at its widest section named Corso Vittorio Emanuele; and the Strada Garibaldi, another important street, intersects it north and south. Both are laid with tramways. Of the four principal squares the chief is the large and handsome Piazza Grande, near the centre of the town. Among the principal buildings are the Duomo or cathedral, begun in 1058, partly Romanesque and partly Gothic, with a fine octagon tower and a dome in the centre, the interior painted in fresco by Correggio; the baptistery, in the Lombard-Romanesque style (1196–1270), and covered externally with curious bas-reliefs; the church of La Steccata; the church of San Giovanni, which, with other churches and buildings, contains paintings by Correggio and by Parmigiano, the latter of whom was born there and both of whom lived there. Other buildings and places of interest are the ducal palace (now the prefecture); the Palazzo della Pilotta, comprising a museum of antiquities, a gallery of valuable paintings, and library of over 320,000 volumes; and the university founded in 1512, with faculties of law, medicine and science, 42 professors and over 600 students. The chief manufactures are of silk, cottons, woolens, felt hats, etc. Traces of a prehistoric pile-village of the Bronze Era and of an Etruscan town, precede the authentic history of Parma as a Roman colony. Pop. about 54,000. Parma, the province, has an area of 1,250 square miles, and population of about 300,000. It is watered chiefly by the Taro, the Parma and the Enza, all of which fall into the Po. It is covered by branches of the Apennines on the south. Parma, the duchy of, formerly an independent state of northern Italy, but since 1860 incorporated in the kingdom of Italy, and divided into the provinces of Parma and Piacenza. As an independent state it comprehended the three duchies of Parma proper, Piacenza and Guastalla, and had an area of 2,766 square miles. The government was an absolute monarchy. During the decline of the Roman Empire this territory became part of the kingdom of Lombardy. Charlemagne, having conquered that kingdom, made a present of Parma to the Pope, who long possessed it. In the subsequent quarrels between the popes and the emperors both Parma and Piacenza became independent republics. In 1512 Pope Julius II regained possession; and in 1543 Paul III erected them into a duchy in favor of his son, Luigi Farnese, whose line became extinct in 1731. Don Carlos, son of Philip V of Spain and Elizabeth Farnese, obtained possession in the face of a protest by the Pope, and kept it till 1736, when he became king of the Two Sicilies. A claim was now put in by Austria; but the Treaty of Aix-la-Chapelle in 1748 gave possession to Philip, another son of Philip V and Elizabeth Farnese. The victories of the French in Italy in the beginning of last century enabled Napoleon to seize the duchy and attach it to his kingdom of Italy. After Napoleon's downfall it fell to the Archduchess Maria Louisa for life, and thereafter to the Duke of Lucca and his descendants, until 1860 witnessed its annexation to Sardinia and its incorporation with the kingdom of Italy. The chief industries are factories for the manufacture of musical instruments, linens, silks, woolens, glass, leather, hats, tobacco and iron products; and the principal trade is in cattle, grain, wine and the products above mentioned. Consult Blashfield, 'Italian Cities' (New York 1912).

PARMENIDES, pär-mĕn'ĭ-dēz, Greek philosopher, head of the Eleatic school: b. Elea, in southern Italy, and flourished about the middle of the 5th century B.C. In 460 he went to Athens, with his pupil Zeno, and made the acquaintance of Socrates, then a young man. He was held in high esteem by both Plato and Aristotle for the depth of his intellect and the loftiness of his character. His only writings consist of a didactic poem, 'On Nature,' in epic verse, composed in the Ionian dialect. In the first part of the poem he treats of that which *is*, of absolute being, which reason alone is able to conceive and demonstrate; and in the second part of that which *appears*, of the phenomena of the senses. Pure being he opposes to all that is multiplex and mutable, as well as to non-being, and excludes from the notion of it the elements of time and space, origination and termination, identifying it finally with thought. Being cannot be predicated of the phenomenal world, which is illusion. The second part of his poem begins with the remark that truth's discourse and thought are now ended, and mortal opinion only remains to be considered. Consult Burnet, John, 'Greek Philosophy' (Vol. I, London 1914); Karsten, 'Philosophorum Græcorum Reliquiæ' (1835); Stein, 'Symbola Philologorum Bonnensium in Honorem Ritschlii' (1864–67); Vatke, 'Parmenidis Veliensis Doctrina' (1864).

PARMENIO, pär-mē'nĭ-ō, or **PARMENION**, Macedonian general under Philip and Alexander the Great: b. about 400 B.C.; d. Ecbatana, 329. A trusted counsellor and able lieutenant of Philip, he carried to a successful issue many campaigns during his master's life. In 356 he defeated the Illyrians; and in 342 carried on a successful campaign in Eubœa. While he was on a war mission in Asia Minor, Philip was assassinated; and Parmenio used his influence in behalf of Alexander whose accession was thus assured. Alexander also had great confidence in him, although deprecating the conservative prudence of the older man. While Parmenio was in Media, his son, Philotas, was found guilty of treason against Alexander and executed, and soon after his execution the father, too, was put to death; either because Alexander feared that he would attempt to take vengeance for the death of his son, or because the son implicated him in the plot.

PARMESAN (pär-mę-zăn') **CHEESE**, a cheese originally made in Parma, of skimmed milk flavored with saffron, and celebrated for its keeping qualities. It had to be grated when used.

PARMIGIANO, Il, ēl pär-mē-jä'nō. The popular name of Francisco Mazzola, an Italian painter, so named from Parma, his birthplace. See MAZZOLA, FRANCESCO.

PARNAHYBA, pär-nä-ē'bä, a river of northern Brazil. See PARANAHYBA.

PARNASSIENS, Les, lā pär'nạ'syăṅ', a school of French poets which took its name from a collection of poetry entitled 'Le Parnasse Contemporain' (1866), and which contained considerable work by younger poets, although it also included that of men of established reputation such as Leconte de Lisle, Laprade, Banville, Baudelaire, Gautier and others. Later issues were published in 1869 and 1876. The Parnassian school headed by Leconte de Lisle, at whose home meetings were held, adopted as its motto, "Art for Arts' Sake" and sought to establish a higher order of poetry, avoiding sentimentality, pedantry and the expression of personal emotions, while striving for perfection in form. Among the best known of the school were Anatole France, François Coppée, Catulle Mendès, Sully Prudhomme, Xavier de Ricard and Armand Silvestre.

PARNASSUS, pär-năs'ŭs, in ancient geography, a mountain in Phocis, near the Gulf of Corinth and the frontier of Bœotia and Attica. To the northeast lies the plain of Cephissus, to the west the plain of Amphissa, to the south two narrow valleys, and the northwest and southeast passes between it and Giona and Helicon, respectively. Parnassus has two snow-capped peaks, each over 8,000 feet high, Lycorea, now Lykeri (the name is also given to the entire mountain), is at the southeast and is only 80 feet higher than Tithorea, now called Gerantorachos or Hierondovrachos. The site of Castalia, a fountain of inspiration and of the temple of the Delphic Apollo (on the southern slope), Parnassus has become a symbol of poetry and *belles-lettres*. The name Parnassus is also given to the whole range of mountains.

PARNASSUS, Pa., borough in Westmoreland County, on the Allegheny River, 17 miles northeast of Pittsburgh, on the Pennsylvania Railroad. It is situated in a region devoted to agriculture, lumbering and coal mining, and has glass works, white lead and linseed-oil factories, and manufactures car equipment. Pop. 2,578.

PARNELL, pär'nĕl, **Charles Stewart**, Irish political leader: b. Avondale, County Wicklow, 27 June 1846; d. Brighton, Sussex, 6 Oct. 1891. He was educated at Magdalene College, Cambridge, which he left without a degree. In 1872–73 he visited the United States, and in 1875 was elected to Parliament as member for County Meath. He allied himself with Joseph Biggar and began the policy of obstructing parliamentary proceedings, in order to bring pressure to bear on the government, and obtain concessions for Ireland. In 1879 he was chosen first president of the recently started Land League; he now visited the United States a second time to raise funds for the League, and was well received by even the most extreme of the Irish party. At the general election of 1880 he was elected for three Irish constituencies, but chose to sit for Cork, which he represented to the last. He now became the chairman of the Irish parliamentary party. The methods of the Land League, especially the system of "boycotting," warmly advocated by Mr. Parnell, and the general state of Ireland, led the Gladstone government to bring in a Crimes Bill and an Arms Bill in 1881, both of which were passed, but not till after violent opposition from the Parnellites in Parliament. A Land Act was passed in the same session, and as the government saw that an attempt would be made to thwart its operation, Parnell was arrested and lodged in Kilmainham Jail with several of his supporters. In reply to this a "No Rent" manifesto was issued, which caused the suppression of the Land League, but boycotting and crime continued. In the spring of 1882, by what has been called the "Kilmainham Treaty," Parnell was set at liberty, having promised to lend some assistance in checking crime. In 1886 Gladstone definitely declared in favor of Home Rule, and gained the support of Parnell and his party; in that same year the Home Rule Bill was introduced, and after its rejection Parnell and Gladstone were in close alliance. In 1887 Parnell and others of his party were accused by the London *Times* of complicity with the crimes and outrages committed by the extreme section of the Irish Nationalist party. To investigate these charges a commission of three judges was appointed by the government in 1888, with the result that, after a great deal of evidence received from both sides, a report was laid before Parliament in February 1890, acquitting him of the graver charges against him; and he obtained £5,000 ($25,000) damages in a suit for libel against the *Times*. In 1890 he was proved the guilty corespondent in the divorce case of Captain O'Shea, and afterward married Mrs. O'Shea. The affair, however, ruined his political career. The Irish party at first reappointed him their chairman, but shortly afterward a letter from Gladstone to John Morley was published stating that if Parnell continued to be leader it would be «disastrous in the highest degree to the cause of Ireland,» which, of course, implied that the support of Gladstone and his party would be withdrawn from Parnell. He was then deserted by the great majority of his parliamentary followers, and the Irish priesthood made a determined stand against him. He by no means tamely acquiesced in this position of affairs, but fought vigorously to the last to maintain his position as leader of the Irish people, thus overtasking his strength and breaking down his health. Parnell as a speaker was reserved and dignified; he had an unusual knowledge of parliamentary law, which he used most effectively, and for a time he completely dominated his party, making it a force both respected and feared in English political life.

Consult Hansard, ‹Parliamentary Debates› for 1875–91; Bryce, ‹Studies in Contemporary Biography› (1903); Mahoney, ‹Life of Parnell› (1886); McCarthy, Justin, ‹A History of Our Own Time›; Moore, ‹Parnell and His Island› (1887); O'Brien, ‹Life of Charles Stewart Parnell› (1888); O'Connor, ‹The Parnell Movement› (1890); O'Shea, K., ‹Charles Stewart Parnell› (New York 1914); Sherlocke, ‹Life of Parnell› (1887); ‹Memorial Volume to Charles Stewart Parnell,› with a biography by Walsh (1892).

PARNELL, Thomas, Anglo-Irish poet: b. Dublin, Ireland, 1679; d. Chester, England, July 1718. He was educated at Trinity College, Dublin, took orders in the Church of England in 1700, and in 1706 was made archdeacon of Clogher. He was intimate with Pope, whom he assisted in his translation of Homer and wrote the essay prefixed to it, ‹Essay on the Life, Writings and Learning of Homer› (1715). In 1713 he was appointed prebend of the cathedral of Dublin through the influence of Swift, and in 1716 was made vicar of Finglas. He was the intimate and associate of the foremost English and Irish writers of his day, among them Gay, Arbuthnot, Pope and Swift. His poems were published by Pope in 1721 and in 1758 a second volume entitled ‹The Posthumous Works of Parnell› was also published. Consult Goldsmith, ‹Life of Parnell.›

PAROCHIAL SCHOOLS. See PARISH SCHOOLS, ROMAN CATHOLIC.

PARODY, a literary composition in which the style, form or expression of dignified writings are closely imitated, usually in a humorous or satirical manner. Among English parodies the best are the famous ‹Rejected Addresses of James and Horace Smith.› The term is also applied to burlesque musical works.

PAROLE (from the same term in French meaning «word»), a term used *in law* and in military affairs. In law, something done verbally or by word of mouth, in contradistinction to what is written; thus an agreement may be by parole. Evidence also may be divided into parole evidence and written evidence. (See EVIDENCE). (2) *In military affairs,* when a prisoner of war receives full liberty within certain limits on promising not to attempt to escape he is said to be on parole; or he may get leave to depart from custody on promising that he will return at the time appointed; or he may give his parole not to fight again during the continuance of the war. The release of prisoners of war on parole came into use with the disuse of the old custom granting the captor right to hold his captives indefinitely for ransom. At first it was only extended to officers in exceptional cases. Breach of parole is reckoned infamous in all civilized nations. The word parole is also used as a password; a word given out each day in orders by the commanding officer in camp or garrison, by which friends and foes may be distinguished. It is used as a check on the countersign. The parole is sent sealed in the form of an order to those entitled to it. It differs from a countersign in being given only to officers, or those who inspect and give orders to the guard. The Hague Conference of 1889 defined the conditions of parole and provided that prisoners of war may be liberated on parole only when their country so authorizes. If paroled each person so liberated binds himself, on his personal honor, to fulfil all the conditions of the parole: and his own government is in honor and duty bound to require of him no services in any way conflicting with his observances of the fulfilment of the conditions of his parole. If the government objects to the condition of the parole it should return to captivity the person so paroled. A person found bearing arms against the government by which he has been paroled, or against its allies, may be tried by military court in which case conviction usually means the sentence of death. Consult Higgins, A. P., ‹The Hague Conference and other International Conferences› (New York 1909); Scott, J. B., ‹Texts of the Peace Conference at the Hague 1899 and 1907› (Boston 1908); ‹Instructions for the Government of the Armies of the United States in the Field›; Spaight, J. M., ‹War Rights on Land› (London 1911).

PARONYCHIA, *in botany,* the name of a genus of plants of the family *Silenaceæ,* known popularly as the nailworts, or whitlow-worts. They are tufted herbs, distinguished as having no corolla, the flowers consisting of a five-parted calyx, five stamens and a pistil, sometimes five-parted. About 50 species are known, those of the United States being mostly perennials. They are natives of the temperate and warmer regions, a very few varieties being found in semi-tropical localities.

PAROPAMISUS, pär-ō-păm'ĭ-sŭs, the Greek name of a part of the Hindukush Range to the west of Kabul and forming the border of Kohistan. It has, in modern times, come to be applied, in a somewhat more restricted sense, to the watershed between Herat and the frontier of Russia, along the river Kushk which lies at an elevation of about 1,000 feet above sea-level.

PAROQUET. See Parrot.

PAROS, pā'rŏs, an island of the Cyclades in the Greek Archipelago, four miles west of Naxos from which it is separated by a channel from four to six miles. It is nowhere more than 15 miles long or nine miles wide. It has a perimeter of 36 miles and an area of 82 square miles. In the centre of the island rises Mount Hagios (Helias or Saint Elias), to an altitude of about 2,400 feet. The summit of the mountain which occupies the entire island is largely composed of fine marble; the best variety, called «lychnites,» were at one time much used in Greek statuary. The marble quarries are no longer worked, but the old roads to them are plainly to be seen. The fertile soil grows vines and grain. The capital city of the island Paros (now Parikia) was settled first by Cretans and then by Peloponnesians. Its people joined the invading Persian armies in 490 and 480 B.C. After Marathon, Miltiades (q.v.) attempted to reduce the city, but was unsuccessful. A year later, defeated by Themistocles, it entered the Athenian league. After the downfall of Macedon the city came into the hands of the Ptolemies. In 197 it was restored to Athens by the intervention of the Romans; and half a century later became subject to Rome. The island was the birthplace of Archilochus. Pop. about 10,000.

PAROTID GLAND. See Salivary Glands.

PARQUETRY, ornamental inlaid woodwork, generally used for floors. Sometimes, however, wainscots, walls and even ceilings are paneled in parquetry. The designs are geometric patterns executed in differently tinted woods. Parquet flooring had long been in use in France but it became popular in the reign of Louis XIII. The rectangular designs used in parquetry are much larger than those used in marquetry (q.v.).

PARR, Catherine, English queen, sixth wife of Henry VIII: b. 1512; d. Sudeley Castle, 5 Sept. 1548. The daughter of Sir Thomas Parr, master of wards and controller to Henry VIII's household, she was well educated, and thanks to her wealth was married when a mere girl to Edward Borough, then to John Neville, Baron Latimer, who died in 1542; and, though apparently engaged to Sir Thomas Seymour, brother to Lady Jane, 12 July 1543, became the wife of Henry VIII. To her step-children, and not only to the young Edward VI, the heir apparent, to whom she may have been tutor, but to Mary and Elizabeth, who had been declared illegitimate and who, because of her influence, were restored to their rank as princesses, she showed tender love and great kindness. To her influence was due much of the love of learning later shown by Elizabeth. She also did much to mitigate the severity of the six articles and to restrain Henry VIII from excessive cruelty against the recusants. The story that her life was endangered by a plot accusing her of heresy and that she assured the king that in matters of religion she had never argued with him nor objected to his remarks save to profit by his wisdom, thus saving herself and bringing discredit on the lord chancellor and her other enemies, may not be wholly free from additions and changes at the hands of Foxe, who tells it, but it is none the less characteristic. During the absence of the king at the siege of Boulogne she acted as regent (1544). A few months after the king's death Catherine married Sir Thomas Seymour, probably in April 1547. She died in September of the next year, a month after bearing him a daughter. Her purity, grace and learning made her a very attractive figure. She showed herself strongly interested in the universities and wrote several devotional works.

PARR, Louisa Taylor, English novelist: b. London, about 1848; d. November 1903. Her earlier years were spent in Cornwall, and in 1869 she was married to a physician and made her home in Kensington. Among her novels are 'How it all Happened' (1868); 'Dorothy Fox' (1870); 'The Prescotts' (1874); 'Gosau Smithy' (1875); 'Adam and Eve' (1880); 'Robin' (1884); 'Loyalty George' (1888); 'Dumps' (1891); 'The Squire' (1892); 'Can this be Love' (1896); 'The Follies of Fashion.'

PARR, Samuel, English classical scholar and clergyman: b. Harrow, Middlesex, 26 Jan. 1747; d. Hatton, Warwickshire, 6 March 1825. After two years at Cambridge University he became an assistant master at Harrow School, and in 1776 head master of Colchester School. Taking orders in the Established Church he became perpetual curate of Hatton, and in 1820 was appointed to a prebend's stall in Saint Paul's Cathedral. He possessed a wonderful memory, was a brilliant talker and esteemed a weighty scholar, but his reputation does not seem justified by his writings, which with a memoir by John Stone appeared in eight volumes in 1828. Consult also Field, 'Memoirs of Dr. Parr' (1828); De Quincey, 'Dr. Samuel Parr on Whiggism in its Relations to Literature.'

PARR, Thomas, or **OLD PARR,** English centenarian, supposed to have lived to be 152 years old: b. according to tradition, 1483; d. London, 14 Nov. 1635. His home was Winnington, near Shrewsbury; there he entered service in 1500, was married in 1563, and in 1588 (at 105) did penance in the church of Alberbury for incontinence. He married again in 1605, and in 1635 was sent as a «piece of antiquity» to court by the Earl of Arundel. The change of air killed the old man. It is more than dubious that the tradition as to Parr's age is correct. The story in its popular form is given in John Taylor's 'The Olde, Olde, Very Olde Man' (1635). Consult *Fortnightly Review* (London April 1869), 'Sir G. C. Lewis and Longevity.'

PARRAL, pär-räl', **HIDALGO DEL PARRAL,** or **SAN JOSÉ DE PARRAL,** Mexico, city of the state of Chihuahua, a little more than 120 miles southeast of Chihuahua. Its wealth is in its silver mines, which have been worked for years and are now run by American capital; the old mines, Jesús María, Mina, Prieta and Tajo, are in the centre of the city; seven miles northeast of Parral is Minas Nuevas. There are ore-crushing machines in the city. Parral is also famous for its aguardiente and other vinous products. Pop. about 15,000.

PARRAMATTA, păr-ą-măt'ą, or **PARAMATTA**, New South Wales, Australia, a city of Cumberland County, on the Parramatta River, 14 miles (by rail) northwest of Sydney. It lies west of Port Jackson; has broad streets, detached houses, street railways, a beautiful park and a large orphan asylum. It is the site of Sydney reservoir; is itself a railroad centre; and is connected with Sydney by rail and by steamer. Only the Sydney settlement is older than that at Rosehill, as Parramatta was first called. It was the first shipping port for Australian grain, and the surrounding country is now full of orange groves and orchards. There are woolen manufactures, salt works and copper-smelting furnaces near the city. Pop. about 15,000.

PARRAS DE LA FUENTE, pär'räs dā lä fwān'tā, Mexico, city of the state of Coahuila, 83 miles west of Saltillo and 34 miles east of the salt lagoon of Parras. It is about 1,800 feet above sea-level in a fertile district growing orchard fruits, grapes and cotton, and with silver mines near. The principal industries are the manufacture of wines and brandies, some cotton-spinning and silver refining. Pop. about 25,000.

PARRHASIUS, pą-rā'shĭ-ŭs, Greek painter: b. Ephesus, 4th century B.C.; d. about 388. According to the account of Seneca he purchased an old man as a slave and employed him as a model for his Prometheus, torturing him in such a way as to obtain a vivid representation of the bound and agonizing Titan. With Zeuxis he was one of the leaders of the Ionian school of painting. He painted 'Ajax Wrestling With Ulysses for the Arms of Achilles.' His artistic contest with Zeuxis is famous. The picture of the latter, it was said, attracted the birds to peck at the painted fruit, while Zeuxis himself was deceived by the representation of a curtain which Parrhasius depicted upon the wall with such exact truthfulness as to give the impression that it concealed a picture. He was credited with having been the first great master of correct drawing and the management of light and shade to convey rotundity. He dealt chiefly with mythological subjects. He was remarkable for purity of tone in painting and exquisite modeling of forms. None of his work survives; and it is known only through the descriptions and criticisms of it given in classical writers. Yet it long survived as models and a source of inspiration for Greek artists. Consult Xenophon, 'Memorabilia' III, 10.

PARRICIDE, (1) the murder of either parent. (2) The murder of any ascendant or person entitled to reverence. By Roman law the term included the murder of either parent, a brother or sister or any child. By Scots law it includes only parents or grandparents. By French law it includes any legitimate ancestor, and is treated with great severity, as it is by the laws of many other European countries. In the United States and England the punishment is the same as for an ordinary murder. (3) The person who commits such a crime.

PARRIS, păr'ĭs, **Samuel**, American clergyman: b. London, England, 1653; d. Sudbury, Mass., 27 Feb. 1720. He studied at Harvard, was in commerce at Boston, but subsequently was ordained, and in 1689–96 was first minister of Danvers, then part of Salem. He started the Salem witchcraft delusion in 1692 by beating Tituba, a South American slave of his, until she confessed herself a witch. The notion spread, and during the 16 months of its prevalence, 17 persons were put to death. In these cases Parris was active for the prosecution. Charges were brought against him by his parish in 1693, and though he admitted his error, he was dismissed in 1696. He afterward preached in Stow and Concord, and for six months in 1711 at Dunstable. Consult Fowler, 'Life and Character of Rev. Samuel Parris' (1857).

PARRISH, păr'ĭsh, **Edward**, American pharmacist: b. Philadelphia, 31 May 1822; d. Fort Sill, Indian Territory, 9 Sept. 1872. He was graduated at the Philadelphia College of Pharmacy in 1842 and engaged in practice in Philadelphia. In 1864 he became professor of materia medica at the College of Pharmacy, and from 1867 until his death he occupied the chair of practical pharmacy. He was actively associated with the founding of Swarthmore College and was its first president, in 1868–70. He was a member of the committee of revision of the United States Pharmacopœia in 1850 and in 1860; was one of the original members of the American Pharmaceutical Association, serving as its president in 1868. He died of fever while acting as United States peace commissioner to the Indians. He wrote 'An Introduction to Practical Pharmacy' (1856); 'The Phantom Bouquet' (1863); 'As Essay on Education' (1866).

PARRISH, Maxfield, American artist and mural decorator: b. Philadelphia, 25 July 1870. He studied at the Pennsylvania Academy of Fine Arts and was later a pupil of Howard Pyle. Haverford College gave him the LL.D. degree. As an illustrator, he is well known for his posters and magazine covers. He designs in flat tints, strong and delicate outline, and elaborately detailed ground, or background. He has illustrated 'Mother Goose in Prose'; Washington Irving's 'Knickerbocker's History of New York'; Kenneth Grahame's 'Dream Days' and 'Golden Age'; 'The Arabian Nights'; 'Eugene Field's 'Poems of Childhood'; and other humorous works with signal success. The 'Bulletin Board' is among the best known of his paintings, and his principal mural decorations are in the possession of James J. Storrow, Boston; Mrs. Harry Payne Whitney, Westbury, L. I., and Hotel Knickerbocker, New York; Hotel Sherman, Chicago; Palace Hotel, San Francisco. Curtis Publishing Company of Philadelphia have 16 of his panels. He is a member of the Society of American Artists, National Academy of Design, honorary member of Philadelphia Water Color Club.

PARRISH, Stephen, landscape painter and etcher: b. Philadelphia, 9 July 1846. He first exhibited in the Pennsylvania Academy (1878) and 1879 in the New York National Academy. Since then he has produced a series of landscapes, usually large canvases, showing much power of expression and poetic feeling. Among these may be mentioned 'The Road to Perry's Peak,' 'Low Tide,' 'Evening' and others, exhibited in New York, Boston and other American cities, London, Liverpool, Munich, Paris, Vienna and Dresden. One of the foremost American etchers, especially notable is his treatment of American coast scenery, as in the series 'Cape Ann to Marble Head.' The subjects of his earlier work were mostly taken from the New England coast and harbors, and in later years from the Connecticut Valley.

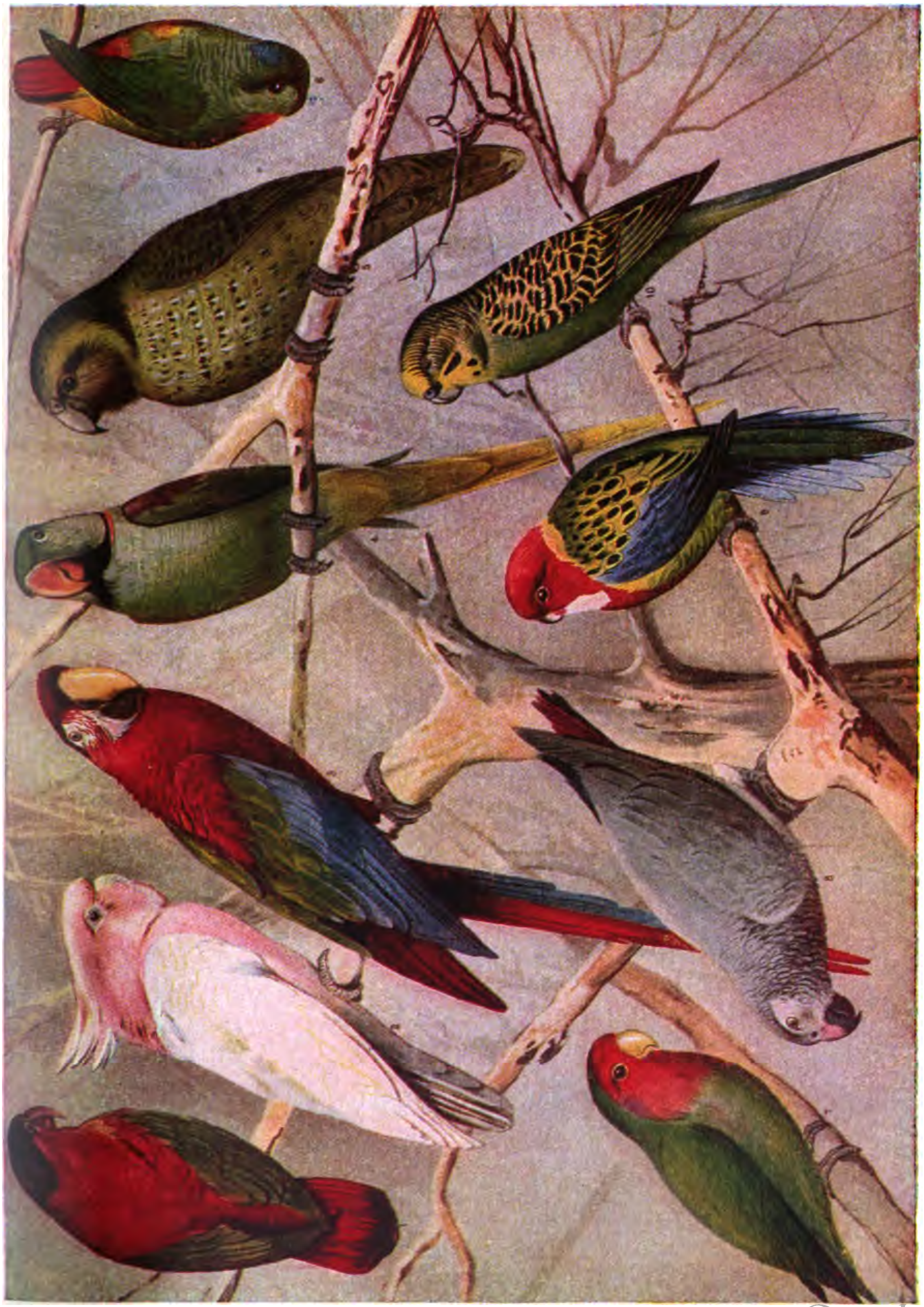
PARROT, the name applied generally to birds of the very strongly marked order *Psittaci*, the members of which are distinguished by the large size and arched form of the upper mandible, which terminates in an acute point overhanging the shorter lower mandible. The upper mandible is freely hinged to the skull and its sides are frequently serrated or cut into teeth-like processes. The nostrils are situated in the *cere*, at the base of the mandible. By the reversion of the fourth or outer one the toes are paired,— a disposition fitting the feet admirably for climbing. The two front toes are united at their bases by membrane, the hinder toes being free; and the adaptation of the feet is completed by the short stout tarsi, covered with rough granulated scales. The bill also aids these birds greatly in their peculiar mode of locomotion among the tree tops. The wings are of moderate size; but the tail may be short or elongated, and in some instances assists in climbing. Unlike that of most other birds the tongue is soft and fleshy throughout and serves with the upper mandible as a prehensile organ. In some species it is bushy or fringed. Parrots abound in the warm and tropical regions of the world, but rarely extend into the Temperate zone except in the Australian region. There distribution presents many remarkable features: thus, while none occur in the Philippine Islands, species are extremely numerous in the Celebes, Solomons and intervening groups. They are particularly abundant in Central and South America and their fossil remains are found within the Arctic circle. The food ordinarily consists of seeds, fruits, buds and flowers, but rarely of tubers or even insects. These birds break open the hard husks of nuts, etc., by aid of their beaks, with great ease and dexterity. They are slow and clumsy walkers, but good climbers and strong fliers. Parrots are monogamous in habits and are said to mate for life. Their nests are generally constructed in the holes of trees, occasionally in earth banks. At other than the breeding season they are gregarious and, with rare exceptions, arboreal. The classification of the parrots is by no means settled; but most recent schemes do not depart widely from that proposed by Count Salvadori, who divides them into six families, of which the *Psittacidæ* or true parrots is subdivided into six subfamilies and comprises, in its 56 genera and about 400 species, the bulk of the order, among them the macaws (q.v.) and parrakeets. The other families are the *Cacatuidæ* or cockatoos (q.v.), with 6 genera and 30 species; the *Loriidæ* or lories, with 14 genera and 85 species, found chiefly in Australian regions and the Moluccan groups, the *Cyclopsittacidæ*, with 2 genera and 18 species, of the same region, the *Stringopidæ*, containing only the remarkable nocturnal and terrestrial owl-parrot or kakapos of New Zealand, and the *Nestoridæ*, formerly of six species, but three are now extinct, another equally remarkable New Zealand parrot, one variety (*N. Kea*) of which has acquired the unique habit of killing sheep for the purpose of feeding upon their kidney fat.

Of all this great assemblage of about 560 species of parrots the vast majority inhabit the Australian and Malayan region and South America; Europe has none and the United States only two, both probably doomed to early extinction. The Carolina paroquet or parrakeet (*Conurus carolinensis*) formerly ranged throughout the coastal plain from Virginia to Florida. A few colonies remain in the neighborhood of Lake Ocheechosee in the latter State. The other variety known as the Louisiana paroquet (*C. C. Ludovicianus*) formerly ranged the Mississippi Valley to the southern shores of Lake Erie, and west to Oklahoma. It is now found only in southwestern Arkansas and northwestern Louisiana. The Carolina paroquet has its head and neck yellow, with orange shadings, the shoulders and thighs orange and the rest of the plumage dazzling green. The Louisiana variety is bluish or peacock green and is somewhat larger in size. These birds were formerly gregarious and roamed irregularly in large flocks which subsisted on fruits, nuts and grains. During the breeding season it was likewise colonial and laid its roughish, white elliptical eggs in hollow trees. These species are not true parrakeets, but stand between the macaws and true parrots. Another species found in the United States along the Mexican border is the Thick-billed parrot (*Rhynchopsitta pachyrhyncha*), a Mexican species, occurring in considerable numbers sometimes in Arizona.

Many exotic species of parrots are exhibited in zoological gardens or by bird fanciers, some of the best known of which may be mentioned. The gray parrot (*Psittacus erythacus*) of western Africa is the form which acquires the power of talking in greatest degree. The extent to which these birds can imitate the various tones of the human voice is astonishing and is one of the most remarkable instances of readiness to acquire an accomplishment of no utility to themselves known among the lower animals. These parrots grow exceedingly docile, and may live to a great age, instances being on record of birds attaining an age of 70 or more years. Of almost equal repute as a «talker» is the Mexican double yellow-head (*Amazona oratrix*).

American species of parrots number 190. Of them all the macaws (*Anodorhynchus*) are the largest. The great Blue macaw is three feet in length and is found most abundantly in Paraguay and Brazil. The Blue-and-Yellow macaw is 30 inches in length, and is adorned also with hues of orange and olive-green. The Red-and-Blue macaw is the most brilliant of all, scarlet red above and underneath, with a blue-black and bright yellow shoulders. It has a wide range from Mexico to the valley of the Amazon. The Green parrakeet of Argentina

PARROTS, PARRAKEETS AND MACAWS



1. Purple Capped Lory. 2. Leadbetter's Cockatoo. 3. Red and Blue Macaw. 4. Ring Necked Parrakeet. 5. Kakapo. 6. Blue-Crowned Hanging Parrot. 7. Rosy-Faced Love-bird.
8. Common Gray Talking Parrot. 9. Rosella Parrakeet. 10. Grass Parrakeet, or Budgerigar.

(*Myopsitta monachus*) is abundant, ranging southward to Patagonia. Of the parrotlets, or so-called "Love-Birds," there are 14 American species in the territory from Mexico to Brazil. The green parrots are American in their distribution, a familiar form being the Amazonian Blunt-tailed parrot (*Chrysotis amazonicus*). This bird is colored a bright green, and possesses a blue strip across the forehead; while the cheeks, tips of the wings and throat may be colored red or yellow. It chiefly inhabits the Orinoco territory, but extends southward on the continent. Some 45 species of this parrot are found throughout tropical America. The lories (*Loriidæ*) possess a bill of more slender form than the preceding species, with a wavy or sinuous margin. The plumage is brilliantly colored, mostly crimson and green; and in some cases it has been proved that the females are red and the males of the same species green, although the red and green lories were formerly considered to be generically distinct. Some of the species are remarkable among parrots because of the elongation of the papillæ of the tongue into brushes of filaments, on which account they are styled brush-tongued parrots. They feed largely on the nectar of flowers. The lories are particularly characteristic of the Moluccas and New Guinea, where many of them are the most richly colored of all birds.

The parrakeets constitute the largest subfamily (*Palæornithinæ*) of the *Psittacidæ;* and are characterized by the generally small size of the body and of the beak, the upper mandible being also less convex or arched than in the true parrots. The tail-feathers are very long and form graceful and trim. The islands of the Eastern Archipelago form the chief habitat of these birds, but species also occur in India, Cochin China, Ceylon and Australia. Among the most familiar forms included in this subfamily are the Rose-ringed and Alexandrine parrakeets. The former (*Palæornis torquata*) is found in India and also on the eastern coasts of Africa. It averages 15 inches in length, the tail making up nearly two-thirds of this. The body-color is a bright green, the specific name being derived from the presence of a pink circle around the neck. The Alexandrine parrakeet (*P. alexandri*) of India is a nearly-allied species. These birds may be taught to speak with distinctness. From three to four eggs are produced, the nest being situated in holes of trees and similar places.

The ground parrakeets of Australia are so named from their terrestrial habits, these forms never perching on trees, but inhabiting flat grounds, and living in plains or among the reeds and grass swamps. They generally live in solitary pairs. The nest is of simple construction and situated on the ground. The common ground parrakeet of Australia (*Pezoporus terrestris*) possesses a green and black plumage, the tail being similarly colored, and the body-feathers having each a band of dark-brown hue. It measures about 12 inches in length, inclusive of the tail. The grass parrakeets of Australia, of which the common cage-bird, the small warbling parrakeet (*Melopsittacus undulatus*) is a good example, are also to a great extent terrestrial in habits. They inhabit the central flat lands of Australia and feed on the seeds of the grasses covering the plains. They perch on the eucalypti or other trees during the day, and the eggs are deposited in the hollows of the trees. The English name of the species above mentioned is derived from the warbling notes they emit — a sort of song differing widely from the general coarse screech of the parrot tribe. The genus *Neophema* also includes several representative forms of Australian grass parrakeets. Among other interesting forms of these peculiar birds are the Pygmy parrots, tiny forms scarcely three inches in length, inhabiting the Papuan Islands, and the Bat parrots (*Loriculus*) of Australia, so-called because of their bat-like habit of hanging head downward. They not only sleep in this position, but often hang thus in groups, caressing and feeding one another. Of the true "Love-birds" (*Agapornis*) there are nine species, the best known being the Rosy-faced species.

Parrots take very naturally to domestication, and in their native countries many species frequent human habitations or have even become more or less completely domesticated. During the luxury-loving period of the Roman Empire the African species were first brought to Europe as pets or food, and since then fully three-fourths of the known species have been exhibited in Europe and America. The favorite cage birds are the talking gray and green parrots of Africa and South America, respectively. They are readily taken by means of snares or bird lime and decoys, or the young are taken from the nest and raised by hand. Some of the smaller species breed readily in confinement. The chief requisites to success in keeping them are plenty of good fresh food, both dry and succulent, cleanliness and opportunity for exercise.

Consult Greene, W. T., 'Parrots in Captivity' (3 vols., London 1884–87), and 'Parrakeets: their Breeding and Management' (London 1898); Knowlton, F. H., 'Birds of the World' (New York 1909); Page, C. N., 'Parrots and Other Talking Birds' (Des Moines 1906); Ridgway, R., 'The Birds of North and Middle America' (Bulletin No. 50, United States National Museum, Washington 1916).

PARROT-FISHES, fishes of the large marine family *Scaridæ,* allied to the wrasses. The body in this family is oblong, with the back arched, dorsal fin long and low, tail short, square and powerful, scales large and round and head terminating in a parrot-like beak, containing numerous small teeth fused into a single mass. These fishes are mainly tropical, herbivorous, usually of brilliant coloration and of little value, in the estimation of North Americans, for either food or game. The smaller ones usually lurk about weedy shores, hiding and feeding among the algæ; larger species are to be found about coral reefs. In Hawaii several species are regarded as excellent to be eaten raw, and are caught regularly by native fishermen; and others are daily trapped and brought to market in the West Indies, especially about Porto Rico, where they go under the general name of oros. The best known, probably, is the turquoise blue parrot-fish or "tumble rose" (*Scarus cæruleus*). which sometimes weighs 15 or 20 pounds, and is caught from Virginia to Brazil. Another common and important one on the Florida coast and throughout the West Indies is the guacamaia (*Pseudo-scarus guacamaia*), which is usuallv about two feet in length. Consult Jordan, J. D., ‹A Guide to the Study of Fishes› (New York 1905).

PARROTT, păr'ŏt, **Robert Parker**, American inventor and ordnance expert: b. Lee, N. H., 5 Oct. 1804; d. Cold Spring, N. Y., 24 Dec. 1877. He was graduated at the United States Military Academy in 1824, for the next five years taught natural and experimental science there, saw active service against the Creeks in 1836 and in the same year became captain of ordnance and a member of the Ordnance Bureau in Washington. He resigned his commission immediately after to become superintendent of the West Point Iron and Cannon Foundry at Cold Springs, N. Y. Utilizing the process of hollow casting and cooling patented by General Rodman and using shrunk hoops of wrought iron he perfected the cannon called by his name which showed such wonderful durability in the Civil War, during which his dealings with the Federal government were marked by rare lack of greed and an evident unwillingness to take personal advantage of the needs of the army. He severed his connection with the Cold Spring Foundry in 1867.

PARROTT RIFLE. See ORDNANCE.

PARRSBORO, pärz'bŭr-ō, Nova Scotia, seaport town, port entry and county-seat of Cumberland County, situated on a strait connecting Minas Basin with the Bay of Fundy, 23 miles southwest of Athol, on the Cumberland Railway and the Coal Company Railway. There is a considerable trade in coal and lumber and there are saw, grist mills and a shipbuilding yard. The town has modern waterworks and an electric-lighting plant. Pop. 2,856.

PARRY, păr'ĭ, **Charles Christopher**, Amercan botanist: b. Admington, Gloucestershire, England, 25 Aug. 1823; d. Davenport, Iowa, 20 Feb. 1890. He came to the United States with his parents in 1832 and was educated at Union College and at Columbia University, taking his degree in medicine. He engaged in practice at Davenport, Iowa, in 1846, but in 1849 became assistant surgeon to the Mexican Boundary Survey and afterward devoted himself to scientific researches. He traveled extensively through the southwestern and western portions of the United States studying the flora of the country and in 1867 he became botanist for the Pacific Railroad survey. He was botanist of the United States Department of Agriculture in 1869–71, and arranged the botanical collections of the Smithsonian Institute. He was afterward botanist to commissions of inquiry in San Domingo and remote regions of Mexico. He gathered a collection of more than 18,000 botanical specimens; discovered hundreds of species, of which more than 50 bear his name; and acquired an international reputation. Author of ‹Botanical Observations in Western Wyoming› (1874); ‹Revision of the United States Pacific Coast Species of Arctostaphylos› (1883); ‹The North American Genus Ceanothus› (1888), etc.

PARRY, SIR **Charles Hubert Hastings**, English composer: b. Bournemouth 27 Feb. 1848; d. near Worthing, 7 Oct. 1918. Educated at Eton, Oxford and Stuttgart, he became an underwriter at Lloyd's in 1871, where he suffered serious financial losses that ended his business career in three years. He then devoted himself to composition and gradually worked his way to the front rank of English masters. His ‹Scenes from Prometheus Unbound› was performed in 1880 and the ‹First Symphony› in 1882. A more ambitious work, the oratorio ‹Judith,› was produced in Birmingham in 1888, the first example of a type peculiarly his own. A remarkable series of sacred and secular cantatas followed, but his purely orchestral works, excepting the ‹Symphonic Variations› (1897), were less successful than his works for chorus and orchestra. Among his distinctive choral compositions are Milton's ‹L' Allegro ed il Penseroso,› the song from Tennyson's ‹Lotos Eaters› and the psalm ‹De Profundis.› A series of short cantatas issued from 1903, including ‹Voces Clamantium,› ‹The Soul's Ransom› and ‹Beyond these Voices,› based on Biblical episodes. He wrote ‹The Evolution of the Art of Music› and ‹The 17th Century› for ‹The Oxford History of Music› and various lectures delivered as professor of music at Oxford.

PARRY, SIR **William Edward**, English navigator: b. Bath, England, 19 Dec. 1790; d. Ems, Germany, 8 July 1855. He entered the navy in 1803 and was lieutenant on the *Alexandria*, a frigate employed in protecting the whalers of Spitzbergen (1811–13). In 1818 he joined the Arctic expedition of Sir John Ross, as second in command. The venture proving unsuccessful, Parry was given command of an expedition in 1819, and with the *Hecla* and *Griper* succeeded in reaching long. 114° W., earning thereby the £5,000 reward offered by Parliament to the ship which should first reach that point. On this expedition he entered Baffin Bay and discovered Barrow Strait, Prince Regent Inlet, Melville Sound, Banks Strait and Wellington Channel. He wintered at Melville Island and returned to England the following year. In a second expedition to the Arctic regions (1821–23) he spent two winters on the east coast of Melville Peninsula waiting for the breaking up of the ice, which did not take place, and in studying the Eskimos and collecting scientific data. A third Arctic expedition resulted in the wrecking of the *Fury* at Prince Regent Inlet. In 1827, with the consent to the Admiralty, Parry attempted to reach the North Pole by Spitzbergen. Leaving the *Hecla* at Turenberg Bay, he started for the pole in two steel boats fitted with steel runners, to be used as sleighs on the ice. The party, which consisted of 28 men, had provisions for 70 days. It gained a point farther north than any then reached (82° 45'), the farthest north reached for 48 years. Parry was knighted in 1829, made admiral in 1852 and in 1853 was appointed lieutenant and deputy governor at the Greenwich Hospital. He wrote ‹Voyages for the Northwest Passage› (1821); ‹Narrative of an Attempt to Reach the North Pole in Boats› (1827). Consult Parry, Edward, ‹Memoirs of Admiral Sir W. E. Parry› (London 1857).

PARRY ISLANDS, Canada, an Arctic archipelago of Franklin territory, north of Melville Sound, Barrow Strait and Lancaster Sound. The principal islands are Bathurst, Cornwallis, North Devon, Melville and Prince Patrick, all of which have no permanent settlements. Parry (q.v.) in 1819 wintered on Melville Island and the islands and surrounding region were thoroughly explored during the Franklin Research expeditions. They are bleak and inhospitable; the coasts precipitous and rocky, and glaciers cover the interior.

PARSEES, pär'sēz («Parsis,» people of ancient Persia), the small remnant of the followers of the ancient Persian religion of Zoroaster (Zarathustra or Zerdusht). The relation in which Zoroaster stood to the Iranian faith has been much discussed; his existence has even been denied; and it is difficult to state clearly the original principles of the Zoroastrian faith. (See Zoroaster; Avesta; Zend). At first the doctrine was monotheism; and Zoroaster taught the existence of but one deity; the Ahura-Mazdâo (Ormuzd), the creator to whom all good things, spiritual and material, belong. But his speculative philosophy was a dualism. The two sides of Ahura-Mazdâo and Angrô-Mainyush (Ahriman), who represented Good and Evil, God and the Devil, and Parseeism became a characteristic dualism.

The Zoroastrian creed flourished up to the time of Alexander the Great, but rapidly declined under his successors. Ardashir (Artaxerxes) (212 A.D.), a native Persian, attempted the restoration of the partly lost, partly forgotten books of Zoroaster, which he effected through the inspiration of a Magian sage, chosen out of 40,000 Magi. The sacred volumes were translated into the vernacular and distributed, and fire-temples were built throughout the length and breadth of the land. The Magi or priests were all-powerful and hated Greek civilization. «Far too long,» wrote the king, «for more than 500 years, has the poison of Aristotle spread.» The Jews have left us some account of the oppression to which they as unbelievers were exposed in Persia. In return the Magi were hated by the Jews. From the period of its re-establishment the Zoroastrian religion flourished till, in 651 A.D., the Persian army under Yezdegird was routed by the caliph Omar. The Zoroastrian population was converted to the Mohammedan faith; the remnant that would not apostatize were subjected to severe oppression and persecution. Several thousand «Guebres» are still found in Persia, mainly in Yezd, Kerman and at Teheran. Others found a home on the west coast of India, chiefly at Bombay, Surai, Ahmedabad, where they now live under English rule and form one of the most respectable and thriving sections of the community, to the number of over 100,000. Parsee traders have also settled at Calcutta, Madras, Aden, Zanzibar, in Burma and in China, where they bear equally with their poorer brethren in Persia the highest character. Their general appearance is prepossessing, and many of their women are beautiful. They conform to the laws of the country they inhabit; and its language is also theirs, except in the ritual of their religion, when Zend is used by the priests as laity. They value highly an English education, and not a few have studied law in England. Conspicuous among Parsee merchant-princes was Sir Jamsetjee Jejeebhoy. In 1891 there were 89,994 Parsees in India, 60 per cent of them in Bombay.

Parsees eat nothing cooked by a person of another religion; and touch neither beef nor pork. Marriages can only be contracted with persons of their own caste and creed. Polygamy, except after divorce, is forbidden. Persons convicted of unchastity are put to death. Their dead are not buried, but exposed on an iron grating in the Dakhma, or Tower of Silence.

Ahura-Mazdâo being the origin of light, his symbol is the sun, the moon, the planets and fire. Temples and altars must be fed with the holy fire, brought down from heaven and the contamination of whose flame is punishable with death. The priests themselves approach it only with veiled face, and only touch it with sacred instruments. Parsees never consider fire and light as anything but emblems of divinity. Their ethical code may be summed up in the three words — purity of thought, of word and of deed.

Consult Bharucha, 'Zoroastrian Religion and Customs' (1893); Haug, 'Essays on the Sacred Language, Writings and Religion of the Parsees' (2d ed., by West, 1878); 'Dosabhai Framji Karaka, C. S. I., 'History of the Parsis' (2 vols., 1884); Hovelacque, 'L'Avesta, Zoroastre, et el Mazdeisme' (1880); Jackson, A. V. W., 'Persia Past and Present' (New York 1906); Menant, Delphine, 'Les Parsis' (Paris 1898); Modi, J. J., 'The Religious System of the Parsis' (Chicago 1893); 'Early History of the Parsis' (Bombay 1905).

PARSIFAL, pär'sē-fäl, name of an opera by Richard Wagner. The fable of the drama is founded on an episode in the Arthurian cycle, which Wolfram von Eschenbach put into metrical form in his Perceval, and the pursuit of the Holy Grail, and this appears to have been the source of Wagner's inspiration. The composer took three years to complete his work, finishing the outline of his music scheme in 1879 and the orchestration in 1882, the year in which the opera was first performed at Baireuth. He places the scene at Monsalvat, Spain, in the Castle of the Holy Grail. Klingsor, the malignant magician, has thrown his spell over Amfortas, formerly a Knight of the Holy Grail, who has been wounded by the Holy Spear, which he has been dispossessed of by the sorcerer. Klingsor hopes to gain control of the knights through the lovely Kundry, who will seduce them to break their vow of chastity. Parsifal is cast out from the castle by the knights because of his indifference to the Holy Grail, which they adore. But he is impenetrable to the spells of Klingsor and the charms of Kundry, and finally recovers the Holy Spear from the magician. He has been brought to a sense of the Holy Grail's significance and importance and starts out in search of it. He is eventually crowned king by the Knights of the Holy Grail. Kundry repents and dies after baptism in hope and peace; while the wound of Amfortas, which no salve has been able to close, is healed by contact with the Holy Spear. 'Parsifal' was first produced in the United States in December 1903, in New York City. See Wagner, Richard.

PARSIS. See Parsees.

PARSLEY, a biennial herb (*Carum petroselinum*) of the order *Umbelliferæ*. During its early stages the leaves are arranged in a rosette and rarely rise more than six inches above the ground, but when in flower the plant may be three feet tall. It bears pinnate leaves divided and subdivided in threes, and in cultivated varieties greatly divided. It is a native of southern

Europe, where it has been cultivated for centuries as a «sweet herb» and whence it has been carried to civilized countries throughout the world. In some regions it has become naturalized. Formerly it was employed in medicine, but now is used principally as a garnish or as a flavoring ingredient in soups, stews, dressings, etc., for which purpose the «moss-curled» varieties are most popular. The «fern-leaved» sorts are more dainty, and the «plain» rather coarse. Hamburg parsley is a variety with large carrot-like roots, which are boiled and served like other roots or used for flavoring soups, stews, etc. The plant succeeds best in rich, light loam well supplied with nitrogenous plant-food. Since the seed is very slow to germinate, it should be soaked before planting and some radish seed planted with it to mark its position and thus permit of early cultivation. The plants are thinned to stand about six inches asunder in rows 18 inches apart and given clean cultivation throughout the season. In the autumn the roots may be transplanted to the greenhouse or a window-box for a winter supply of leaves, or they may be left in the ground until spring, when they will furnish a supply. The frequent removal of the leaves and the cutting out of the flower-stalk when it first appears will extend the season of production until new plants are in bearing.

PARSLEY, Giant. See Cow-PARSNIP.

PARSNIP, a biennial herb (*Pastinica sativa*) of the family *Apiaceæ*. Its stout, grooved, hollow stem which rises from a rosette of radical odd-pinnate leaves, often grows more than four feet tall. The small yellow flowers are followed by disc-shaped fruits («seeds»), which retain their vitality only one year. The plant is a native of western Asia and adjacent Europe, where it was cultivated before the Christian era, and whence it has been taken by man to all civilized countries in temperate climates. In many places it has become a troublesome weed in neglected fields, and as such it loses its thick root and may even become an annual. Its roots, which often attain a length of 18 inches and a diameter of three or four inches at the crown, are used as a vegetable and as food for livestock. The plants succeed best in deep, fairly rich, well-drained but moist loam, free from stones and other obstructions. The seed, being slow to germinate, should be sown very early in the spring and some radish seeds sown with it. The radish plants which appear quickly will show the positions of the rows and thus permit early cultivation. They must be removed promptly when the parsnip plants appear. The rows should be about 18 inches apart and the plants six inches asunder in the rows. Clean cultivation must be given until the plants shade the ground. Since the roots are improved by frost if left in the ground they need not be stored; but if stored they must be kept moist to prevent their shriveling and thus becoming tough. In the spring the roots should be used before growth starts, because they quickly become acrid. There are a few short-rooted varieties which are adapted to shallow and stony soils.

PARSON, in English law, the rector of a parish; also, in a general sense, one that has a cure of souls, a clergyman, or minister of the gospel. He is called parson (Latin *persona*), because the Church is represented in his person. A parson in England has for life the freehold of the parsonage house, glebe, tithes and other ecclesiastical dues. The modes of becoming parson involve four requisites, namely, the taking of holy orders, presentation, institution and induction. The duties of a parson are principally ecclesiastical, such as carrying on divine service in the parish church, administering the sacraments, preaching, etc. A parson during his lifetime may lose his parochial preferment either by cession, in taking another living, by consecration; on promotion to a bishopric, when all other preferments become void; by resignation, but only when accepted by the bishop; and lastly by legal deprivation, for heresy, infidelity, gross immorality or other causes.

PARSON-BIRD, or POÉ-BIRD, a small bird (*Prosthemadera novæ-zealandiæ*), one of the honey-eaters, a native of New Zealand and the islands of Australia. Its plumage is jet-black, with metallic iridescence, except two prominent globular lappets of white feathers on each side of the throat, which look like the white lawn «bands» of a Church of England clergyman. It has a fine song, great powers of mimicry for which it is popular as a cage bird. Its flight is embellished with somersaults and other remarkable antics.

PARSONS, pär'sônz, **Albert Ross,** American musician and archæologist: b. Sandusky, Ohio, 16 Sept. 1847. He was educated in Buffalo, N. Y., and Germany, 1867–72, and became prominent as a specialist in musical pedagogy and technics, and he has also devoted much study to archæology. As a pianist and a composer of pianoforte music he gained considerable attention and he has acted as a critic of music. He has lectured on Dante and other literary subjects, designed the symbolic pyramid mausoleum at Greenwood cemetery, and has written 'Wagner's Beethoven' (1870); 'Parsifal, or the Finding of Christ through Art'; 'Science of Pianoforte Practice'; 'The Secret of Wagner's Genius'; 'New Light from the Great Pyramid' (1893); 'Cornet Joseph Parsons' (1897); 'The Road Map of the Stars' (1911); 'Surf Lines' (1913); 'Religion and Philosophy'; 'The Virtuoso Handling of the Piano, Advanced Exercises' (1917); 'An Evening Prayer' (poem, 1917).

PARSONS, Alfred William, English painter: b. Beckington, Somersetshire, 2 Dec. 1847. He has made his specialty water-color landscapes of English scenery, executed with great dash yet lightness of touch, accuracy of drawing and dazzling color. His pictures have been awarded medals at Paris (1889); Chicago (1893) and Munich (1893). He also designs in black and white, and in collaboration with E. A. Abbey (q.v.), has furnished illustrations for 'Old Songs'; 'A Quiet Life'; Herrick's poems, 'She Stoops to Conquer'; 'Alone' (from Wordsworth's Sonnets); the 'Warwickshire Avon' and 'Notes on Japan' (text also by Parsons); 'The Danube from the Black Sea to the Black Forest,' and for *Harper's Magazine* and other publications. Among the most characteristic of his paintings are 'When Nature Painted All Things Gay' (1887), brought by the Chantrey bequest; and 'A Mid-May Morning.'

PARSONS, Charles, American artist: b. Manchester, England, 8 May 1821; d. 1910. He was educated in New York; studied art at the National Academy; was elected an A. N. A. in 1860; worked as a lithographer 1838–61; and became director of the art department of Harper and Bros., for whose publications he furnished many illustrations, and from whose employ he retired in 1889. He won some repute as a landscape painter and exhibited at the National Academy and the exhibitions of the Water Color Society. His best known paintings are 'Salem' (1876); 'November' (1877); 'Gravesend Bay' (1878) and 'Old Orchard' (1884).

PARSONS, Sir Charles Algernon, English inventor and shipbuilder: b. 13 June 1854. He was the fourth son of the Earl of Rosse and was educated at Saint John's College, Cambridge. He established the electrical and engineering works of C. A. Parsons and Company at Heaton, Newcastle-on-Tyne and the Parsons Marine Steam Turbine Company as well as electrical supply companies at Cambridge and Scarborough. He invented the Parsons Compound steam turbine, introduced in 1884 and later improved; non-skid chains for automobiles; the auxetogramophone and a geared turbine. He was elected to the Royal Society in 1898; was justice of the peace in Northumberland and was knighted in 1911. He delivered the Rede Lecture for 1911, which he later published, 'The Steam Turbine' (1912).

PARSONS, Charles Lathrop, American chemist: b. New Marlboro, Mass., 23 March 1867. He was graduated at Cornell University in 1888 and in 1890–1911 he was professor of chemistry at New Hampshire College. In 1911 he was appointed chief mineral chemist at the Bureau of Mines, Washington, D. C. His researches on the atomic weight of beryllium won for him the Nichols medal in 1904. He has contributed many scientific papers to chemical journals and government bulletins, and with Prof. A. J. Moses is author of 'Mineralogy, Crystallography and Blowpipe Analysis' (1895–1911); 'Beryllium, Its Chemistry and Literature' (1908).

PARSONS, Frank, American lawyer and political economist: b. Mount Holly, N. J., 14 Nov. 1854; d. Boston, Mass., 26 Sept. 1908. He was graduated from Cornell in 1873; studied law and was admitted to the bar in Boston. He rewrote several law treatises, including Morse 'On Banks and Banking,' Perry 'On Trusts,' and May 'On Insurance,' and in 1892 was appointed lecturer on law at Boston University. He became known through his books and lectures as a student of political economy. From 1897 to 1900 he was professor of history and political science at Kansas Agricultural College, and in 1900 became professor of political science at Ruskin College, Trenton, Mo. He was dean of the university extension department there, and lectured for the University Extension Association of Chicago. In 1901–02 he was an expert witness before the United States Industrial Commission on the public ownership of railroads, telephones and telegraphs. His publications include 'The World's Best Books' (1892); 'Our Country's Need' (1894); 'The Drift of Our Time' (1898); 'Rational Money' (1899); 'The New Political Economy' (1899); 'The Power of the Ideal' (1899); 'The Bondage of Cities'; 'The City for the People' (1900); 'Direct Legislation' (1900); 'The Story of New Zealand'; 'The Heart of the Railway Problem' (1906); 'The Railways, the Trusts and the People.' He was among the leaders of the progressive economists and an earnest advocate of the public ownership of monopolies.

PARSONS, Herbert, American politician: b. New York, 28 Oct. 1869, son of John Edward Parsons (q.v.). He was educated at Yale, the University of Berlin, Harvard Law School and the Metropolis Law School, and was admitted to the bar in 1895. He was alderman in New York in 1900–03, and served in Congress in 1905–11. He was president of the Republican county committee in 1905–10 and was an effective worker for the nomination and election of Charles E. Hughes for governor. He is senior member of the law firm of Parsons, Closson and McIlvaine. In 1915 he was delegate-at-large at the New York State Constitutional Convention; was appointed a member of the Republican National Committee for 1916–20; and in 1917 was commissioned major in the Aviation Reserve Corps.

PARSONS, John Edward, American lawyer: b. New York, 24 Oct. 1829; d. 16 Jan. 1915. He was graduated at the University of New York in 1848 and was admitted to the bar in 1852. He engaged in practice in New York and gained a high reputation. In 1891–1910 he was counsel for the American Sugar Refining Company, successfully defending the company's interests in its trial under the Sherman Act in the Supreme Court, and winning a favorable decision in January 1895. In the course of an investigation of alleged weight frauds in 1909 he, together with other officials of the company, was indicted. The trial resulted in a disagreement and was not retried. He was a director of the Metropolitan Trust Company, was actively interested in the welfare of several hospitals and in the work of Cooper Union.

PARSONS, Lewis Baldwin, American soldier and lawyer: b. Genesee County, N. Y., 5 April 1818; d. Flora, Ill., 16 March 1907. He was graduated from Yale in 1840, from the Harvard Law School in 1844, and established a law practice in Alton, Ill, where he was city attorney in 1846–49. At the outbreak of the Civil War he entered the Union army as captain of volunteers, served through the war, with promotion, was chief of river and railroad transportation of the national armies and was retired in 1866 with the rank of brevet brigadier-general of volunteers. He afterward devoted himself to law practice, and in 1895–98 was president of the Illinois Soldiers' and Sailors' Home.

PARSONS, or PERSONS, Robert, English Jesuit and controversialist: b. Nether Stowey, Somerset, 24 June 1546; d. Rome, 15 April 1610. He was educated at Oxford, was elected fellow of Balliol in 1568, and in 1574 became its dean. In 1574 Parsons went to the Continent, and on his way to Italy stopped at Louvain, where he was probably received into the Roman Catholic Church, and at Rome entered upon his novitiate in the Society of Jesus (1575). In 1578 he was ordained priest and made English penitentiary at the Vatican. With Edmund Campion (q.v.) and several secular priests he arrived in England in 1573 under instructions from Aquaviva, general of the order, to aid the secular clergy and on no account to discuss political questions. At that time the Jesuits were forbidden to set foot in England on pain of death; and Parsons landed at Dover in a military disguise. He encouraged the secular priests, then closely in hiding, converted many of the nobility and set up a secret press, which was transferred from place to place at his order, and printed controversial tracts, among them Parsons' 'Brief Discourse' (1581) and Campion's well-known 'Decem Rationes' (1581). Campion was at last seized, but Parsons escaped to Normandy (1581). He continued, however, to devote his energies to the restoration of the Roman Catholic Church in England, and did everything possible to promote the attempted invasion of England in 1588 by Philip II of Spain, which ended so disastrously in the defeat of the Armada. He used his influence with the Catholic courts of Europe to save Mary Queen of Scots. For a short time in 1588 he was rector of the English College at Rome, and in 1582-92 established various schools and seminaries in France and Spain for English Catholics. From 1597 until his death he was rector of the English College and later was made prefect of the Jesuit mission. By virtue of this office, confirmed to him in 1606, he had direct control of all foreign seminaries governed by the order. He was an indefatigable worker, an unrivaled controversialist, and a writer the clearness and simplicity of whose English has been highly praised. His 'Book of Resolution, or the Christian Directory' (1582, and subsequently enlarged) was often reprinted, and Dean Stanhope prepared a Protestant edition of it (1700). Consult Foley, 'Records of the English Province of the Society of Jesus'; Gee, 'The Jesuits' Memorial' (1690); More, 'Historia Provinciæ Anglicanæ Societatis Jesu' (1660).

PARSONS, Samuel Holden, American soldier: b. Lyme, Conn., 14 May 1737; d. Big Beaver River, Ohio, 17 Nov. 1789. He was graduated from Harvard in 1756, admitted to the bar in 1759 and engaged in law practice at Lyme. For 18 years he was a member of the State assembly and is accredited with originating the idea of a general colonial congress. At the outbreak of the American Revolution he was appointed colonel and stationed in Massachusetts. He planned the capture of Ticonderoga executed by Ethan Allen, and after the evacuation of Boston by the British was transferred to New York, there he participated in the battles of Long Island, Harlem Heights and White Plains, and later served under Washington in New Jersey. He was a member of the board which tried General André, and in that year was promoted major-general and succeeded to the command of General Putnam, which he held until the close of the war. After the war he resumed his law practice, was appointed by Washington in 1789 the first judge of the Northwest Territory and took up his residence near Marietta, Ohio, where he was drowned in the Beaver River in the same year. Parsons has been accused of giving information to Sir Henry Clinton concerning the state of the Federal armies, and letters are said to be in existence written by him to that general. A refutation of this charge was written by George B. Loring. Consult Hall, C. S., 'Life and Letters of Samuel Holden Parsons' (Binghamton 1905); Loring, G. B., 'A Vindication of General Parsons' (Salem 1888).

PARSONS, Theophilus, American jurist: b. Byfield, Mass., 24 Feb. 1750; d. Boston, Mass., 30 Oct. 1813. He was graduated from Harvard in 1769, studied law, was admitted to the bar in 1774, and began practice in Falmouth, Me., but his prospects were interrupted by the almost total destruction of that place by the British in 1775. He then returned to Byfield, where he studied law for several years, and laid the foundation of the vast legal knowledge for which he was afterward distinguished. Settling in Newburyport he there established a large practice, and taking an active interest in politics allied himself with the conservatives, who later became the Federalist party. He was, in 1778, a member of the «Essex Junto,» which opposed the adoption of the State constitution approved by the legislature. The pamphlet entitled 'The Essex Result,' undoubtedly written by him and circulated widely throughout the State, did much toward the rejection of the constitution. He was a member of the convention which, in 1779, framed the constitution ultimately adopted by Massachusetts, and he also served as a member of the convention which ratified the Federal Constitution in 1788. His attitude toward the latter was extremely favorable, and the «Proposition» presented by John Hancock and usually credited to him was written by Parsons. After the adoption of the Constitution he took no further active part in politics, but devoted himself to his profession, and under his instruction John Quincy Adams (q.v.) gained a large share of the legal skill which afterward made him a national figure. In 1800 Parsons removed to Boston, and in 1806 was appointed chief justice of the State Supreme Court, which office he occupied until his death. As a lawyer and a justice he enjoyed an enviable reputation, standing at the head of his profession in his State. His decisions upon the laws governing real property, marine insurance and pleading were regarded as of highest value and he earnestly strove to lessen the delays of the law in bringing cases to trial. A collection of his decisions was published in 1836 under the title 'Commentaries on the Laws of the United States, by Theophilus Parsons, late Chief Justice of Massachusetts.' Consult Knapp, S. L., 'Biographical Sketches of Eminent Lawyers' (Boston 1821); memoir by his son, Theophilus Parsons (1859); Stone, E. F., 'Parsons and the Constitutional Convention' (Salem 1899).

PARSONS, Theophilus, American author, son of Theophilus Parsons (q.v.): b. Newburyport, Mass., 17 May 1797; d. Cambridge, Mass., 26 Jan. 1882. He was graduated in 1815 at Harvard, where he became, in 1847, Dane professor of law. He founded the *United States Literary Gazette* and wrote much in support of Swedenborgian doctrines. He published a 'Treatise on the Law of Contracts' (1853); 'Elements of Mercantile Law' (1856); 'Memoir of Chief Justice Parsons' (1859); 'Law of Partnership' (1867); 'Deus Homo'

(1867); 'The Infinite and the Finite' (1872); and 'The Rights of a Citizen of the United States' (1875).

PARSONS, Thomas William, American poet: b. Boston, 18 Aug. 1819; d. Scituate, Mass., 3 Sept. 1892. He went to Europe at 17 and spent several years in Italy, where he devoted himself to the study of Dante; and on his return to Boston in 1843 he studied at the Harvard Medical School, practised dentistry in Boston and London and devoted the last 20 years of his life to literature. He wrote 'Ghetto di Roma' (1854); 'The Magnolia' (1867); 'The Old House at Sudbury' (1870); 'The Shadow of the Obelisk' (1872); and 'Circum Præcordia' (1892), all poems of much lyric beauty, but too elevated in tone and thought to be popular, his 'Lines on a Bust of Dante' first printed in 1841 being the exception. Parsons is better known as the «poet» of Longfellow's 'Tales of a Wayside Inn,' and best as the author of a matchless version of parts of Dante's 'Divina Commedia,' namely the 'Inferno' entire (1867), and much of the 'Purgatorio,' with scanty fragments of the 'Paradiso.' An edition of his poems appeared in 1893.

PARSONS, Usher, American surgeon: b. Alfred, Me., 8 Aug. 1788; d. Providence, R. I., 19 Dec. 1868. He studied medicine with Dr. John Warren in Boston and in 1812 entered the United States navy as surgeon's mate. At the battle of Lake Erie he was acting surgeon on the U.S.S. *Lawrence* and in recognition of his services was promoted full surgeon. He afterward served under Perry on the frigate *Java,* and in 1820 he resigned and returned to private practice at Providence. He was professor of anatomy at Dartmouth College in 1820–22; and of anatomy and surgery at Brown in 1823–28. He was president of the Rhode Island Medical Society in 1837–39 and was the first vice-president of the American Medical Association in 1853. Author of 'The Art of Making Anatomic Preparations' (1831); 'Sailors' Physician' (1851); 'The History of the Battle of Lake Erie' (1852), etc.

PARSONS, William Barclay, American civil engineer: b. New York, 13 April 1859. He was graduated from Columbia in 1879, and from the Columbia School of Mines in 1882. He at once entered the service of the Erie Railroad, resigning after a few years to take up general practice as consulting engineer. In 1894 he became chief engineer of the Rapid Transit Commission of New York, and designed and carried out the underground railway there. He has been connected professionally with railroad construction in various parts of the world, especially in China. He was a member of the Isthmian Canal Commission (1904) and of the board of consulting engineers of Panama Canal (1905); and brigadier-general, chief of engineers of the State of New York, and has been trustee of Columbia University since 1897. Besides contributing to various periodicals and to the 'Encyclopædia Americana,' has published 'Track' (1885); 'Turnouts' (1885); 'An American Engineer in China' (1900).

PARSONS, Kan., city in Labette County, on the Saint Louis and San Francisco and the Missouri, Kansas and Texas railways, about 125 miles in direct line south by east of Topeka. It was settled in the early «settlement days» of Kansas, but was laid out and incorporated in 1871, and in 1873 was made a city of the second class. It is in a productive agricultural region and the commercial centre of quite an extent of territory. The chief industrial establishments are grain elevators, creameries, flour and feed mills, foundry, agricultural implements works, and railroad car, repair and machine shops. The Missouri, Kansas and Texas Railroad has its general offices in this city. There are two parks, well-kept streets and good roads leading into Parsons. The prominent buildings are the State Hospital for the Insane, the Masonic Temple, the Y. M. C. A. building, churches, schools and the Missouri, Kansas and Texas station and office building. The educational institutions are the high school, public and parish elementary schools and a public library. Natural gas is in general use for lighting and for fuel. Pop. about 15,000.

PARSONS, Pa., borough in Luzerne County, two miles northeast of Wilkesbarre, on the Delaware and Hudson and the Central of New Jersey railroads. It is situated in a coal and oil region and manufactures tinware and silks. Pop. 4,338.

PARSON'S CAUSE, a famous case in Virginian colonial history, growing out of acts passed by the house of burgesses in 1755 and 1758, whereby the salaries of the clergy, fixed at 16,000 pounds of tobacco, were made payable in currency, the price being fixed at the rate received for the tobacco in years of normal crops. The original law, fixing the amount of tobacco to be paid the clergy by the planters was enacted in 1696 and was revised and re-enacted by the king in 1748. The acts of the house of burgesses, temporarily suspending payment in tobacco, were due to shortage in crops and a consequently increased value which made the usual 16,000 pounds an exorbitant assessment. The act of 1755 passed without protest from the clergy; but in 1758 the matter was taken to the king and an order of council annulling the act of the house of burgesses was obtained. The act applied to all classes of debtors, but the case became known as the «Parson's Cause» from the fact that the clergy were the only class of creditors to protest. The case was tried in the court of Hanover County, Va., 5 Nov. 1763, Col. John Henry presiding, and Patrick Henry, his son, appearing as counsel against the clergy. Patrick Henry's speech, denouncing the action of the king in breaking his compact with the people and overriding the action of the legislature brought him into widespread public notice, marking the first of his impassioned appeals for the maintenance of the people's established rights under English law. His declaration that the king by his own conduct toward a legally enacted law from being the father of his people had degenerated into a tyrant and had forfeited all rights to his subjects' obedience to his order regarding that law was met with cries of «Treason!»; but the jury returned a verdict of one penny damages, although the court rendered a decision against the validity of the law. Consult Henry, W. H., 'Patrick Henry' (Vol. I, 1891); Tyler, M. C., 'Patrick Henry' (in the 'American Statesmen Series' (1887).

PARSONS COLLEGE, located at Fairfield, Iowa, established in 1875 under the control of the Presbyterian Church. In 1855 Lewis B. Parsons of Buffalo, N. Y., bequeathed $37,000 to "endow an institution of learning in the State of Iowa." In 1874 the Presbyterian Synod of Iowa and the people of Fairfield donated $30,000 to a fund for the establishment of a college in that city, with the aid of the Parsons endowment. The work of the college is arranged in three courses, classical, scientific and philosophical, which lead respectively to the three degrees of A.B., B.S., and Ph. B.; there is also a normal training course, a business course and a preparatory department. The productive endowment of the college was in 1914, over $230,000 a year; and the buildings were valued at considerably over $220,000.

PARTAB, or **PERTAB NARAYAN SINGH,** Sir Maharaja, an Indian Prince: b. 1855. The grandson and successor of the famous Maharaja Man Singh of Mahdauna, who was prominent during the Indian Mutiny. Sir Partab comes from an ancient Rajput family of warriors distinguished by its loyalty to Great Britain. In 1878 he went to Kabul as a member of the mission under the leadership of General Sir Neville Chamberlain, and in 1897 accompanied the Mohmand expedition as aide-de-camp to General Ellis. In 1898 he served in the same capacity with General Lockhart in the Tirah campaign on the Indian Northwest frontier. When Indian troops were being sent to quell the Boxer rebellion in China in 1900, Sir Partab persuaded Lord Curzon, then Viceroy of India, to let him accompany the expeditionary force. On the outbreak of the European War the old warrior, though in his 60th year, insisted on fighting with the British in Europe, taking with him his nephew, a youth of 16. He actually served at the front throughout the whole course of the war, expressing his desire to fall on the battlefield. During two terms as regent and one as Prime Minister he ruled over Jodhpur, an Indian state three times as large as Belgium, and from 1902 to 1911 he reigned as Maharaja of Idar, a state of 2,000 square miles in the Bombay Presidency. He voluntarily abdicated the throne in favor of his adopted son in order to assume the regency of Jodhpur. That came to an end in 1916, and Sir Partab, after a brief visit to India, returned to the Western front, to devote himself entirely to fighting. He is a member of the Legislative Council of the Northwestern Provinces of Oudh.

PARTERRE, păr-tăr', in old French gardens, the open part in front of the house or dwelling, in which flower beds and closely cut lawn were intermingled according to a regular plan. Also a name for the pit or orchestra space in French theatres.

PARTHENIUS, păr-thē'nĭ-ŭs, Greek elegiac poet and grammarian of the 1st century B.C. He was a native of Nicæa in Bithynia, was taken to Rome as a prisoner in the war with Mithridates; but he was soon freed, and became the friend, possibly the Greek teacher, of Virgil, and the intimate of Cornelius Gallus. Virgil borrowed from him a line in the first Georgic (437). For Gallus he composed, in prose, a resumé of love myths suited for elegiac poetry, which still exists under the title *Περὶ ἐρωτικων παθημάτων*, 'On Love's Sufferings,' and is edited in Sakolowski and Martin's 'Mythographi Græci' (1896-1902). Only a few fragments of his many poems, elegies, epicedia and other literary work, remain.

PARTHENOGENESIS. When an embryo develops from an egg without fertilization, the phenomenon is called parthenogenesis. Instances of parthenogenesis are found in all groups of plants from the algæ to the highest flowering plants, but the most thorough studies have been made in the ferns and flowering plants. In the water fern, *Marsilia,* the egg is usually fertilized normally, but sometimes develops without fertilization. The parthenogenetic behavior may occur spontaneously, but may be induced by excluding sperms and raising the temperature or by chemical stimulation. In any case, it is easily determined whether the embryo has resulted from a fertilized egg or from an egg without fertilization; the normal embryo being capped by a mass of mucilaginous material resulting from the disorganization of the neck cell and ventral canal cell, while both these cells appear intact above a parthenogenetic embryo (Figs. 1 and 2).

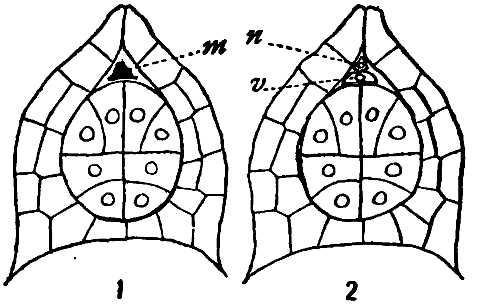


Fig. 1.—Marsilia. Archegonium containing a normal embryo: the section shows eight cells of the embryo *m*, and mucilaginous mass formed by the disorganization of the neck canal and ventral canal cells. Greatly magnified.

Fig. 2.—Similar figure of a parthenogenetic embryo: *n* neck canal cell; *v*, ventral canal cell. Greatly magnified.

Similar cases of parthenogenesis have been found in several of the common ferns. In the Gymnosperms, parthenogenesis is extremely rare and no case has been described in very great detail; but in the Angiosperms, detailed investigations have been made in various groups. It is interesting to note that the common dandelion is regularly parthenogenetic, the embryo developing from the egg without fertilization. In this case, no reduction of chromosomes (see Chromosome) precedes the formation of the egg; consequently, the egg has as many chromosomes as if a normal egg, with the reduced number, had been fertilized by a sperm. It is not known what stimulus starts the development. Some species of Everlasting (*Antennaria alpina*) are always parthenogenetic while others (*Antennaria dioica*) are just as regularly fertilized in the normal way. In the parthenogenetic forms, there is no reduction of chromosomes; while in normal forms, the reduction takes place, so that the egg has he reduced number, which is doubled by the entrance of the sperm. In the Meadow Rue (*Thalictrum purpurascens*), the egg sometimes develops parthenogenetically and sometimes is normally fertilized, so that this species illustrates the transition from normal fertilization to parthenogenesis. The egg which is to develop parthenogenetically has twice the number of chromosomes characteristic of the normal egg. The Hawk Weed (*Hieracium*) is parthenogenetic. Gregor Mendel, whose name has become famous, so that we speak of Mendelism and Mendelian hybrids, crossed species of *Hieracium* and was uneasy because the results did not agree with his work on peas. He did not know that the plant was parthenogenetic and that the pollen, which he applied with such patience, did not take effect. There are cases of parthenogenesis in the lower plants, like *Chara crinita* (Stonewort) among the algæ and *Saprolegnia* (Water Mold) among the fungi. In some familiar laboratory types, like *Spirogyra* and *Zygnema* (Algæ) and *Mucor* (Fungi), where the two conjugating gametes are alike in size and shape, a union sometimes fails to take place and a gamete rounds off and forms a spore without any fusion. Such spores are called parthenogenetic spores or azygospores. In any case, parthenogenesis is to be regarded as a sport or freak, a deviation from the normal course of development. Consult Coulter and Chamberlain, 'Morphology of Angiosperms'; Overton, J. B., 'Parthenogenesis in Thalictrum purpurascens' (*Botanical Gazette*, Vol. XXXIII, 1902, p. 363).

CHARLES J. CHAMBERLAIN.

PARTHENON, The. See ATHENS.

PARTHENOPE, in Greek mythology, a siren cast up by the sea on the shore of Naples. She was said to have drowned herself for love of Ulysses. Parthenope, the ancient name of Naples, was connected with this myth. The name Parthenope was also borne by the daughter of Stymphalus, with whom Hercules was in love.

PARTHENOPEAN (par″thē-nō-pē′ạn) **REPUBLIC**, a name given to the state into which the kingdom of Naples was transformed by the French republicans in 1799. This name was chosen because in the earliest times the city of Naples was called Parthenope. Ferdinand I, king of the Two Sicilies, having joined in 1798 the coalition formed against France, the French general, Championnet, entered Italy at the head of an army, and after having defeated the Austrians in Rome, he invaded the Neapolitan territory and took Naples, 23 Jan. 1799. The republic was then proclaimed, and though at first the change of government was far from being relished by the Neapolitans, they very soon became reconciled to it. It was, however, very short-lived, for on 20 June Cardinal Ruffo, at the head of a mixed body of troops, took possession of the city, and the republic, which had existed only five months, terminated.

PARTHIA, in classical geography, either all the region between the Euphrates and Oxus rivers and the Caspian Sea and the Indian Ocean, or, in a narrower usage, the district bounded by Media, Hyrcania, Ariana, Margiana and the Caramanian desert. The latter use of the term applies to the original home and the former to the empire of the Parthians, who seem to have been of Turanian stock migrating from Central Asia into Iran, where they learned an Aryan tongue, practically equivalent to Persian. The capital city of the Parthians was Hecatompylus; the main product of the country, its splendid horses; and the chief characteristic of the nomad and simple living Parthians, their skill in cavalry battle, notably their ruse of pretended flight, in the midst of which they shot backward from their unerring bows — the origin of the phrase «a Parthian shot,» of which «parting shot» seems a corruption. They were subdued in succession by the Assyrian, Median and Persian monarchies, then fell to Macedon and to the Seleucidæ, but in 250 B.C. they established their independence of the Syrian kingdom of the Seleucidæ after a successful revolt led by Arsaces, who claimed to be of the Persian royal line, and, backed by the Magi, became the first king of the new realm and conquered to the Indus in the east and to the Caspian in the west. This spread of the old Persian national religion and of the new Parthian empire was most successfully carried out by Mithridates I, king 174–136 B.C. The inevitable clash with Rome came in 53 B.C., when Crassus' army was annihilated at Carrhæ. Ventidius gained a slight victory over the Parthians in 38, but Antonius was severely defeated in 35, and no Roman army won a decisive victory over them until 115 A.D. in the reign of Trajan. Even then Rome gained no permanent footing in the Parthian empire. In 217 at Nisibis a battle was fought which gave neither side the victory and assured peace. In 226 the Arsacid dynasty came to an end with the defeat of Artabanus IV, and the Persian Sassanidæ became rulers of the country. Members of the Parthian royal family continued to maintain their power in the mountainous districts of their native country, more especially in Armenia, for several centuries, where they were protected by the Romans for political reasons. Consult Gardner, P., 'The Parthian Coinage' (London 1827); Rawlinson, 'The Sixth Great Oriental Monarchy' (1873), and 'The Story of Parthia' (in 'Story of the Nations' series, 1893); Wroth, W., 'Coins of Persia' (London 1903).

PARTICULAR BAPTIST. See BAPTISTS.

PARTINGTON, Mrs. An American humorist. See SHILLABER, BENJAMIN PENHALLOW.

PARTITION, *in law*, is the division which is made between several persons who own land, goods, chattels or other property which belong to them as coheirs or coproprietors. Technically it applies to the division of real estate between copartners, tenants in common, or joint tenants, and the object is to establish that to which each of the coproprietors is severally entitled. Voluntary partition is made by the owners of an estate, by the conveyance of such part to each other which is to be owned by him. Compulsory partition is effected through special laws providing that remedy. Any kind of property or thing of value, whether real or personal, which is the subject of joint ownership can be the subject of partition, the right of partition being an incident of joint ownership. In law it has been held that a husband and wife, being one, cannot partition an estate held by them. This has been largely remedied by the married woman's acts. In any event this could be accomplished by conveying it to a third, who could reconvey to each in equal shares. Occasionally the question of division is left to arbitration. A partition is often effected by a single deed executed by all the parties in interest, whereby to each is assigned a share, or else by mutual conveyances between the parties. Generally the same effect is given to an agreement for partition as to an act of partition. Partition by judicial proceedings is frequently effected by an ordinary action at law. In the United States the practice in these cases is usually regulated by statute. The title of an applicant for partition to possession must be clear or the action cannot be maintained. The fact that property sought to be partitioned is subject to liens, easements, or a lease, will not generally prevent partition. Mines, mill privileges, water power, and oil and gas under the surface of the earth, have all been the subject of partition proceedings. The courts have refused to partition property which would impair its usefulness to the public. The court in granting relief through partition proceedings does not act ministerially and its object is to adjust equitably the rights of all the parties in interest. See TENANCY; REAL PROPERTY.

PARTITION TREATIES, the name given two treaties made between France and England and the Netherlands in 1698 and 1700, for the settlement of the Spanish Succession. See TREATY AND TREATIES.

PARTNERSHIP, has been variously defined, in one instance as «a voluntary contract between two or more legally competent persons, to place their money, effects, labor, skill, or some or either of them, in lawful commerce or business, with the agreement that there shall be communism of the profits thereof between them.» However, it would hardly be possible to form a definition that would meet every case. Contract between partners is essential; it may be verbal or in writing, and the partners must have accepted its terms. An agreement to share profits is an element essential to partnership, and if such does not exist there is no partnership. The manner of sharing the profits controls the test of partnership. One cannot against his will, or by the conduct of others, be made a partner, but in some jurisdictions under certain circumstances one may be held liable to third parties as a partner, who receives a share of the profits in place of some other consideration. The accepted rule is that persons sharing the profits of a business are not liable as partners to third persons, unless they are in fact partners or have so conducted themselves as to hold out to the public that they are partners. In the United States the commercial idea is that a partnership or firm is an entity separate and distinct from the members composing it. It is so treated in accounting, indebtedness being entered against the firm and not against the individual members. Within the firm itself, accountants make the firm debtor to each partner for what he contributes to the common stock, and each partner is made debtor to the firm for all that he takes out of that stock. Thus partners do not become debtors and creditors of one another as to the firm's business, but are always debtor to or creditor of the firm. The partners are regarded as agents of the firm for the transaction of its business, and sureties of the firm in case of its failure. This commercial view, however, is not established in the law, where the partnership is not recognized as distinct from its individual members. The law regards each partner as acting as principal for himself, and as agent for each of the other partners. To this variance between the commercial view and the legal view is to be attributed much of the conflict of authorities in various States on the many important questions involved.

Partnerships are grouped for classification under four heads: general, special, limited and joint-stock. The general partnership is the association most commonly found in business. The special partnership is one formed for a particular transaction: it is often called a particular partnership. A limited partnership is one in which the liabilities are not equal as between the partners, but limited as to some of them. A joint-stock company is a partnership in which the interests of the partners are represented by shares which may be transferred to other owners without dissolving the partnership.

A secret partner is one whose relation to a firm is unknown to the public, and a silent or dormant partner is one who takes no active interest in the management of the business affairs of the firm, but receives a share of the profits. A nominal partner is one who, though known as a partner, does not share in the profits. A liquidating partner is a member of a partnership which has dissolved, who has charge of winding up the affairs of the company. A special partner is one who is a member of a firm under a statutory limitation.

It must be borne in mind that the existence of a partnership depends upon questions of both law and fact, and that the proper determination of these questions is frequently the subject of conflicting opinions of upper courts. A nominal partner is one who, though known as that in all cases, the question of the existence of a partnership depends on the agreement between the parties and their intention as same may appear from all the surrounding facts. Persons receiving a debt, the payments on account of which are measured by the profits of a business, are not partners; neither is one a partner who is employed as an agent or servant, and receives a part of the profits as his remuneration, but the investment of capital in the business, in addition to rendering services, tends to show the relation of a partner rather than that of employee. Participation in losses tends to show a partnership, but the absence of it tends to show merely a loan; sharing expenses or losses alone does not constitute a partnership. One lending money to another engaged in conducting a business, under a contract to receive a part of the profits in the place of interest, or in addition to the interest, is not a partner, unless he has the usual rights and powers accorded to a partner; one receiving a fixed amount, having no relation to the profits, in consideration for services or property, is not a partner. An important distinction exists between sharing gross receipts and net profits; sharing the former is not evidence of partnership, neither is the division of the results of a joint venture, such as raising a crop. Proof as to the conduct or relation of the parties may be such as to show the existence of a partnership, such as the fact that the alleged partner assumed charge and direction of the business; the conducting of the business under a firm name and the keeping of partnership books may all tend to prove the existence of partnership. Clubs, associations, societies, etc., formed for the purpose of social or political objects and not for profit, are not partnerships. The joint owning of property from which they obtain a profit from its use, does not necessarily constitute a partnership of the owners but may become such through an agreement to carry out a joint venture in which the owners share in the profits and losses.

In entering into a contract of partnership all the general rules of law governing contracts are applicable; generally such contracts are not required to be in writing, except in the case of some statutory provision. In many jurisdictions it is held that a partnership, the object of which is to own or deal in realty, must be set forth in writing. As title to real property cannot be legally vested in the firm, it is held by one of the individual members in trust for the firm. Hence the widow of a deceased partner has been held to have dower rights in such real estate after the firm's debts are paid. A partnership that is to begin after the expiration of one year must be in writing, and it is advisable that a contract for a partnership which is to last for a longer term than one year be in writing. Persons who can make a valid contract are capable of entering into partnership. One not of age may become a partner, but would have the right to rescind his contract, as same would be voidable. A partnership with an insane person is valid, if the parties to the contract were ignorant of the condition of the insane person. A married woman may become a partner, and in some jurisdictions, the partner of her husband. No corporation can become the partner of a person, or any other corporation, unless its charter so permits. Any number of persons may form a partnership. A partnership is void which is created for any object or purpose which is prohibited by law, or which is contrary to public policy. In the absence of a statute authorizing a firm as such to sue, an action must be brought in the individual names of the partners; the same is true of actions brought against partnerships. A firm name is not necessary in law, although it is generally adopted as a matter of commercial etiquette; such name cannot rightfully be used for any purpose other than that connected with the partnership transactions. The firm name is not a part of the «property» of the firm, but is a part of the «good-will.» It thus has a salable value and so is one of the assets of the firm. A purchaser of the good-will of a firm buys the right to use the firm's name. One partner acting for the firm binds the other partners.

The capital of a firm is the sum contributed by the members for the purpose of conducting the partnership business, and is distinguished from the partnership property, which includes everything that the firm may own; the capital may consist of money or property, or the use of property, and may be contributed in different amounts. Upon the dissolution of a partnership the capital is returned, and the proportionate profits, as agreed, divided. In the event of the death of a partner the assets of the firm vest in the surviving partners, and it becomes the duty of the surviving partner, or partners, to settle up the business, and to account to the representative of the deceased partner for his interest.

A partnership may be dissolved, changed or modified at any time by the members, provided that such is not contrary to law. The failure of a partner to fulfil the terms of the agreement of partnership does not necessarily nullify the agreement, but it may be the basis of an appeal to the court for a dissolution. Each partner has the same right to share in the management of the business unless otherwise stipulated in the agreement. The law imposes a very strict duty on the part of partners, their relations with each other, and absolute good faith is demanded; one partner is liable to the others for a strict account of all matters conducted by him that are within the general scope of the business of the partnership. A partner will not be allowed to buy for his personal benefit a claim against his firm but will be held to have bought it for the benefit of his firm, nor will a partner be allowed to obtain a renewal of a lease of the premises occupied by his firm, or to deal in the property of the firm for his own benefit, and if he uses the firm's funds for speculating, he must account to the firm for the money and for the profits. A partner must account for any benefits obtained by him from the information secured in the course of the business of the partnership. Except that the agreement prohibits it, a partner may engage in a business which does not compete with the business of the partnership and is not inconsistent with his duties as a partner. A member of the firm is not entitled to any compensation for extra services under any circumstances, except in the case of an agreement, unless it is necessitated by the wilful negligence of his partner. The partners have a right to insist that accurate accounts be kept of all the transactions of the firm and legally they have access to the books at all times.

Unless there is some agreement to the contrary, the acts of the majority control. The rights of the minority, however, must be afforded every protection and they must have an opportunity of presenting their objections. Members of a firm cannot expel a partner unless that right is given by their agreement. A partnership is liable for any loss or injury caused to one who is not a member of the firm by one of the partners acting in the ordinary course of the firm's business or with its authority; the partnership is also liable for money misapplied by one member of the firm who is apparently acting for it. A judgment creditor can proceed against the individual property of partners without first obtaining execution against the firm property, except that this be contrary to the provisions of the statute governing the partnership.

A partnership may be dissolved at any time by mutual consent, and unless so dissolved the partnership does not terminate until the partners cease to carry on the business. It may be dissolved by the court when one of the partners refuses consent upon various grounds — unprofitableness of the business, fraud, damaging conduct, etc. On the dissolution of a partnership it is desirable to give public notice, this prevents a partner becoming liable to third persons for the acts of his former partners. Partners cannot sue each other in law but courts of equity have jurisdiction to demand accountings and to make a settlement of partnership affairs. Any change in the membership of a partnership effects a dissolution, and if the business continues it is a new firm. See also Agreement; Contract. Consult Burdick, F. M., 'The Law of Partnership: Including Limited Partnership' (Boston 1917).

Henry M. Earle.

PARTNERSHIP ASSOCIATIONS. See Corporations, Legal.

PARTON, Arthur, American artist: b. Hudson, N. Y., 1842; d. 1914. He began landscape painting as a pupil of W. T. Richards in Philadelphia, and has developed a particular talent in the portrayal of scenery in clouded sunlight, or the semi-darkness of declining day. He has been charged with subduing his landscapes with too prevailing a gray tone, but his handling is vigorous as well as imaginative. All his pictures are pleasing and suggestive. This is seen in his 'Nightfall' (1881); and his 'Palisades in Winter' (1885); 'Loch Lomond'; 'Night in the Catskills'; 'Evening — Harlem River'; 'The Ledge' (1913); and 'A Spring Morning' (1914).

PARTON, James, American author: b. Canterbury, England, 9 Feb. 1822; d. Newburyport, Mass., 17 Oct. 1891. He was brought to the United States in 1827 and received his education here. His first literary employment was on the staff of the *Home Journal* of New York. In 1855 appeared his 'Life of Horace Greeley,' of which over 30,000 copies were sold, and which was followed in 1857 by his 'Life of Aaron Burr.' Of this work nearly 20,000 copies were sold during a period of great commercial distress. His success decided him to make literature his life work and this he combined with lecturing on political and literary subjects. In 1875 he removed from New York to Newburyport, Mass. He married Sara Payson Willis (Fanny Fern) a sister of N. P. Willis; and on her death in 1872 he married her daughter by her former husband, Charles E. Eldridge. It was followed by 'Life of Andrew Jackson' (1859-60), a collection of 'Humorous Poetry of the English Language, from Chaucer to Saxe' (1856); 'General Butler in New Orleans' (1863); 'Life and Times of Benjamin Franklin' (1864); 'Famous Americans of Recent Times' (1870); 'Washington' (1872); 'Fanny Fern' (1873); 'Life of Thomas Jefferson' (1874); 'Life of Voltaire' (1881); 'Thomas Jefferson' (1874); 'Caricature and Other Comic Art' (1877); 'Noted Women of Europe and America' (1883); 'Captains of Industry' (1884); 'Triumphs of Enterprise, Ingenuity and Public Spirit' (1871); 'Topics of the Time' (1871); 'Caricature in all Times and Lands' (1875). He was an extremely entertaining writer and a literary force in his day.

PARTON, Sara Payson Willis («Fanny Fern»), American writer, sister of N. P. Willis (q.v.), and wife of James Parton (q.v.): b. Portland, Me., 9 July 1811; d. Brooklyn, N. Y., 10 Oct. 1872. Married early to C. E. Eldridge of Boston and left at his death dependent upon her own resources, she turned to literature, and under her pseudonym, «Fanny Fern,» soon became widely known. 'Fern Leaves,' the first of her collection of sketches, was published in 1853 and 70,000 copies were sold in a short time. This was followed by 'Little Ferns' (1853); 'Fern Leaves, 2d Series' (1854); 'Ruth Hall,' a semi-autobiographical novel (1854); 'Rose Clark' (1857); 'Fresh Leaves' (1857); and 'The Play Day Book' (1857), all of which once enjoyed a considerable popularity, some of them being translated into French and German. For 16 years she contributed a weekly article to the New York *Ledger*. She was married to James Parton in 1856.

PARTRIDGE, pär'trĭj, **Alden,** American educator and soldier: b. Norwich, Vt., about 1785; d. there, 16 Jan. 1854. He was graduated at West Point in 1806 and acted as assistant professor and afterward professor of mathematics there from that time until 1813. He was professor of engineering 1813-16 and superintendent from January 1815 to November 1816 and from January to July 1817. He resigned in 1818 and became the principal of an exploring survey sent out in 1819 to determine the northwest boundary of the United States. In 1820 he founded in his native town the American Literary, Scientific and Military Academy (known as the Norwich Military Academy). In 1834 this was granted a charter by the State and incorporated as Norwich University, with Partridge as its president. At the invitation of other States he subsequently founded similar institutions in Harrisburg, Pa., Portsmouth, Va., Pembroke, N. H., and Brandywine Springs, Del. He was surveyor-general of his native State in 1832 and a member of the Vermont legislature in 1833-34 and 1839.

PARTRIDGE, Bernard, English artist and cartoonist: b. London, 11 Oct. 1861. He was educated at Stonyhurst College and was engaged in stained-glass designing and decorative painting in 1880-84. From 1884 he has occupied himself in illustrating for the press and for book publishers. Since 1891 he has been with the London *Punch*, of which he is chief cartoonist.

PARTRIDGE, John, English astrologer and almanac maker: b. East Sheen, Surrey, 18 Jan. 1644; d. Mortlake, Surrey, 24 June 1715. He was bound to a shoemaker in early youth but contrived to teach himself Latin, Greek and Hebrew, by means of which he gained a knowledge of astrology and he seems to have studied medicine at Leyden. In 1680 he issued the first of his almanacs, 'Merlinus Liberatus,' which with its rarely perfect equivocation soon gained popular favor and quack imitators. Swift, in 1708, prompted in part by a spirit of jest and wishing also to check the flood of quack almanacs, published his 'Predictions . . . by Isaac Bickerstaff,' in which he prophesied the death of Partridge at 11 o'clock at night on the 29th of March. On the 30th he published the announcement of the fulfilment of the prophecy; so thoroughly convincing the public of its truth that Partridge was unable to establish the fact that he was living and he made no further issues of his almanac until 1714, probably deterred by Swift's continuance of the jest in 'Elegy on the Death of Mr. Partridge' (1708) and 'Vindication of Isaac Bickerstaff' (1709). The name Isaac Bickerstaff was taken by Swift from a sign in Longacre. Steel made use of it in the *Tattler* in 1709; and others used it in signed newspaper and periodical articles for many years.

PARTRIDGE, William Ordway, American sculptor and author: b. Paris, France, 11 April 1861. He studied at Columbia University and then received his art education at Paris, Florence and Rome. Adelphi College, Brooklyn, N. Y., conferred on him the degree of M.A. also. Among his works of sculpture are ‘General Grant,’ an equestrian statue for the Union League Club, Brooklyn; the statue of Alexander Hamilton, Brooklyn; the group, ‘Christ and Saint John,’ in the Brooklyn Museum of Fine Arts; the statue of Hamilton and the Schermerhorn Memorial at Columbia University; the statue of Shakespeare and the bust of Edward Everett Hale at Chicago; the Kauffman Memorial, and the baptismal font in the church of Saint Peter and Paul at Washington, D. C., and others. He has written ‘Art for America’; ‘The Long Life of a Sculptor’; ‘The Technique of Sculpture’; ‘The Angel of Clay’; ‘Nathan Hale, the Ideal Patriot’; ‘The Czar's Gift’.

PARTRIDGE, a name properly designating a common European game-bird (*Perdix cinerea*) but applied with little discrimination to a variety of gallinaceous fowls. In the United States the name is given to the ruffed grouse and spruce grouse and with greater appropriateness to a number of birds more or less closely resembling the European partridges and quails. (See Grouse.) Taken in the wide sense the family *Tetraonidæ* includes all of these birds, the American partridges being the subfamily *Odontophorinæ*, which is sometimes united with the Old World partridges under the name *Perdicinæ* or *Perdicidæ*. The latter comprises about 150 species, distinguished by the absence of the serrated edge of the lower mandible, common in the American types. They avoid woodlands and are commonly found in cultivated grounds in groups up to 20 or 25 birds. The *Odontophorinæ* have the bill very short and thick, more so than in the European partridges. Like them, the nostril is covered by a scale, but is not filled with short feathers. The lower mandible is more or less distinctly toothed near the end. Both toes and tarsi are naked and the latter scaly, which characters, with the completely feathered head, offer a ready distinction from the grouse. This group is strictly American, but most of the 40 or 50 described species are confined to Central and South America. Many of the species have the head ornamented with graceful crests of very characteristic forms in the different genera; and remarkably rich and varied color-patterns occur, especially in the males of those species in which the sexes differ. Seven species representing four genera and divided into a number of subspecies and local races, are found within the boundaries of the United States. With a single exception all are western and southwestern and most of them may be considered as an overlapping of the Mexican fauna.

The exception just noted is that of the most prominent and familiar of these birds — the bob-white, which is popularly, if unfortunately, known both as partridge and quail and is described in this Encyclopedia under Quail.

Of the western species the mountain partridge or plumed quail (*Oreortyx pictus*), of the Pacific coast region, especially the mountainous parts of California, Oregon and Washington, is distinguished by the pair of slender black plumes which ornament the head. Those of the male are nearly four inches long and curve gracefully backward; in the female they are much smaller. The extremely handsome colors are similar in the two sexes. These birds are not well known to gunners, are extremely wild, and the coveys scatter quickly by running, taking wing only when hard pressed, when they rise and fly with extreme swiftness. The call of the male is a pleasant whistling note. The eggs are buff-colored. The California partridge or helmet-quail (*Lophortyx californica*) has a crest of several club-shaped feathers, which are erect and curve forward. The male is very richly adorned with soft grays, warm browns and slaty blues, variously marked with black and white. The female is much plainer and has a smaller crest. They have been seen in flocks numbering 500. A paler, grayer variety (*L. c. vallicola*) is known as the partridge or valley quail of California and it has been introduced into the Pacific States northward. When flushed, this species is said almost invariably to fly into a tree. Its notes are harsh and very peculiar. The eggs are spotted and laid in a very carelessly made nest or on the bare ground. Gambel's partridge (*Lophortyx gambeli*) is similar to the last, from which the male is distinguished by the greater amount of black in the plumage, particularly on the face and belly. It is exceedingly abundant in Texas, Arizona and New Mexico, from which it spreads through the surrounding States, especially into California and Nevada. It is equally at home in the mountains and lowlands. The Massena partridge (*Cyrtonyx montezumæ*), also known as the «fool quail» because of its failure to sense danger and make an escape from the hunter, is a bird of Mexico rather than of the United States, within which it is found only in western Texas, Arizona and New Mexico. The sexes are very unlike, the male having the sides of the head white fantastically striped with black, and the under-parts dark thickly spotted with white. The crest is depressed, brush-like and on the occiput. Many of these partridges are extremely variable and numerous subspecies and races of some of them have been described. They are also said to readily hybridize, at least under domestication. The several crested and plumed partridges described give a fair picture also of those occurring in South America, most of which belong to the same or similar genera.

The partridges of the Old World are not clearly distinguished as a group from ours. They are found in most temperate and tropical countries from England and China to Australia.

The common or gray partridge (*Perdix cinerea*) chiefly inhabits the cultivated fields of Britain and the Continent. Mating takes place in February, the males frequently engaging in combats for the possession of the females. The eggs, numbering from 10 to 15, are deposited at the end of May or beginning of June, the female taking upon herself the entire duties of incubation, although the male, after the young birds are hatched, shares the duties of his mate. The partridges are exceedingly solicitous regarding the welfare of the young. The parent birds will run before the sportsman and by fluttering in an opposite direction will strive to distract his attention from the neighborhood of the nest. Selby mentions that he has seen two partridges successfully engage a carrion-crow in battle in defense of their young. These birds in autumn and winter collect in flocks of small size, known as "coveys," but they separate in spring to pair and incubate. The food consists chiefly of grass, young seeds and also of insects; and the birds feed in the early morning and late in the evening. The roosting place of the covey is generally in the middle of a flat field.

The red-legged partridge (*Caccabis rufa*) is common in certain parts of England, having been introduced from the Continent, where it is common. It is found in France, southern Europe generally, and in Guernsey and Jersey. The flesh is of a less succulent and tender character than that of the common partridge. It inhabits healthy places chiefly, but otherwise closely resembles its more familiar neighbor in habits.

The true English quails belong to the genus *Coturnix*, which has the nostrils feathered beneath the covering scale, the bill more slender than in the partridges, the wings somewhat pointed and the tail very short. They are migratory and thus have spread very widely. The common or Messina quail (*C. communis*) is colored much like our bob-white but is smaller, more slender and far inferior from a sportsman's point of view. Rather extensive attempts have been made to introduce the quail into the United States but, in part owing to its migratory habits, in part to the changed conditions they have failed. Naturally this species inhabits a large part of Europe, Asia and Africa. Except for the fact that it is migratory and does not form coveys, its habits are closely similar to those of the bob-white (see QUAIL).

The partridges are readily domesticated and even in the wild state will frequently associate with fowls in the barn yard when food is scarce in the winter. The eggs may be secured and incubated under a bantam hen which naturally cares for the young. Besides the bob-white many of the crested partridges have been thus bred and are familiar sights in the aviaries of zoological gardens and bird fanciers. Consult Knowlton, F. H., 'Birds of the World' (New York 1909).

PARTRIDGE-BERRY, CHECKERBERRY, or SQUAWBERRY, a perennial evergreen trailing vine (*Mitchella repens*) of the family *Rubiaceæ*. It is a native of North America and is found from Nova Scotia to Florida and westward to Minnesota and Texas. The leaves are round, small and glossy; the flowers white or pinkish, tubular, in pairs and very fragrant; the fruits bright scarlet, often two united in one, persistent during winter, almost flavorless. In shady places, on dry soil, the plants seem to thrive best; they are, however, found in moist situations. They are favorites in rockeries and wild gardens and are easily propagated by root-division. The genus, which comprises very few species, one Japanese, another South American, is named in honor of Dr. John Mitchell, one of America's early botanists, a Virginian correspondent of Linnæus. The names partridge-berry and checkerberry are also sometimes given to *Gaultheria procumbens*, which is better known popularly as wintergreen and boxberry.

PARTRIDGE PIGEON, or SQUATTER PIGEON (*Geophaps scripta*), a habitant of the interior of Eastern Australia. It is a light brown above with three black bars on the side of the head. Like the bronze-winged pigeons it has a large metallic area on the wing coverts, but this is greenish to purple instead of bronze. The partridge pigeons are found usually in pairs, or in small companies, and live wholly upon the ground. See also BRONZE WING.

PARTRIDGE-WOODPECKER, an occasional local name for *Colaptes auratus*, the eastern golden-winged woodpecker or flicker. See WOODPECKER.

PARTS OF SPEECH. See GRAMMAR; LANGUAGE, SCIENCE OF.

PARTURITION. See OBSTETRICS.

PARTY BALLOT. See BALLOT.

PARTY EXPENDITURES. See CORRUPT PRACTICES ACT.

PARTY ORGANIZATION IN LEGISLATIVE BODIES. Party organization in the United States is extra-constitutional. That is, American constitutions, State and national, make no provisions for parties and party leadership. Indeed, it would be safe to say that early American statesmen did not encourage or facilitate party organization and control. In England, on the contrary, and in other countries in which the cabinet system of government prevails, party organization is part and parcel of the government itself. The Prime Minister and his cabinet are the leaders of the majority party in Parliament and hold office often by reason of that leadership; the opposition party is equally well recognized; and therefore the parties which hold power can be held rigidly accountable for the use to which they put that power. But while it was possible to avoid making definite provision for political parties in American government, it was not possible to prevent their development or to stop the exercise by them of important powers in administering government. Consequently, in the United States we have not abolished the political party nor its power and influence; we have not been able to get along without it; we have merely, by refusing to give it a recognized place in our governmental system, compelled it to work indirectly and informally. The result has been that the organization of parties in our legislative assemblies has been carried on by party leaders perhaps not themselves the members of any legislative body and not responsible in any open or direct way for their conduct.

Purposes of Party Organization.— Party organization in legislative bodies seeks to accomplish two main purposes. The first of these is the control of legislative policy in such a way as to further party interests. If a party has succeeded in electing a majority in the legislature by going before the people on a definite platform of proposed legislation, it is highly important that the party effect an organization in the legislature that will enable it to redeem its campaign pledges. Secondly, the party leaders wish to be in a position to distribute to loyal party members the patronage available in the selection of the officers, committeemen and other attractive positions which form a part of the formal organization of the legislature. It is important also for the party to capture these places if it is to hope to control legislative policy effectively.

The Machinery of Party Organization.—(a) *The Party Leaders.*— There must be party leadership in order to insure the efficient carrying out of party policy. That leadership may assert itself in several ways. In the first place it may rest upon the shoulders of one man, the boss. Usually the party boss has built up a strong grip on the party, personal in character, and too often by methods which will not bear the light of publicity. He is usually unwilling to expose his past record to the scrutiny of a campaign for public office and contents himself with remaining a private citizen, exercising control over those whom by his power he has placed in office. It is very seldom, in fact, that the boss actually becomes a member of a legislative body or holds any office in it. The organization of the legislature is, however, his work, and the nominal leaders receive their instructions from him. However, the era of the more or less irresponsible party boss is passing away, and as political parties have become more democratic in character party leadership is apt to fall on the shoulders of a man chosen for that purpose by his associates, either by common consent or by formal election. If the party has a majority in the legislature, the party leader will frequently, though not invariably, become speaker of the lower house because of the opportunities open to the speaker to control legislative procedure in the interests of the party. However, it is sometimes more advantageous to have the recognized party leader occupy the chairmanship of one of the most important committees, such as the committee on ways and means in Congress or revenue and taxation in a State legislature. When the party is in the minority in the legislature it does not have the power to secure for its leader any official recognition, but it designates him as its floor leader or «minority leader» and places upon him the responsibility of looking after the party interests in debate and various other matters.

(b) *The Caucus.*— The party caucus is the whole group of party members in a legislative body meeting to determine party policy. As the autocratic boss declines in power and the party becomes more democratic in organization, the caucus takes on more and more authority. Party caucuses have been more influential in governing the policies of Congress where party leadership has been less centralized than in State legislatures, where the boss or an oligarchy of bosses has more frequently thrived. The caucus in the main does two kinds of work. It may create the formal party organization by naming its candidates for speaker, committee chairman and so forth. In many cases the caucus in so choosing the party officials merely ratifies the choice of a smaller group of party leaders who have previously met and prepared a «slate.» The second function of the caucus is to determine whether the party as such shall take a definite stand upon a question of legislative policy and what that stand shall be. This goes far toward establishing a real test of party regularity, because when the party has declared a certain bill pending before the legislature to be a party measure, every member of the party is supposed to vote for it under the heavy penalty of ostracism from the party. Of course relatively few measures are definitely party measures and upon all others no attempt is made to control the discretion of the individual member.

(c) *Committees.*— Effective party organization demands that the majority party have a majority on every legislative committee. As a rule the destiny of legislative bills rests in the hands of the committee to which they are referred. It may quietly pigeonhole a bill or delay reporting it until too late for action. The chairmen and majority members of important committees may exert enormous power over their colleagues by their power to suppress bills in which those colleagues are interested. In these committees also corruption and bribery are most likely to thrive. Persons seeking special privileges or protection from legislation which is objectionable to them may frequently achieve their desires by exerting secret and corrupt influence upon committee members. Dishonesty in such matters is hard to prevent and hard to detect. In addition to these regular legislative committees to which bills are referred, many legislative bodies provide for the appointment of special committees with unusual powers to determine matters of procedure and the order in which bills shall be taken up for action by the legislature. Such a committee is the committee on rules of the national House of Representatives; and in the State legislatures the «steering committee,» as it is called, which is usually appointed at the close of the session for the purpose of deciding which of the numerous bills still pending ought to be brought up for consideration in the short time remaining. These committees have, of course, wide discretion in reporting or killing legislation, and when controlled by a political party offer large possibilities for the domination of legislative policy in the interests of the party. In general it may be said that in spite of the many evils connected with the committee system in legislative bodies, it is hard to see how committees could be entirely dispensed with.

Proposals for Needed Reform.— From the foregoing discussion it is evident that at least two evils result from our present system of party organization in legislative bodies. First, it is usually quite impossible to centre upon the party or on individuals definite responsibility for legislative evils. Second, such a system makes it easy for corruption and dishonesty to thrive undetected. While no one will claim that party influence should be eliminated from legislative bodies, there are several methods suggested by which it is hoped to eliminate the existing evils. These remedies fall into two groups. The first group comprises those which seek to fix responsibility upon the party for the good or bad results of its work. Here are to be found the proposals for the introduction of the English cabinet system into State government, the enlargement of the control of the executive over the legislative policy and the development of a budget system. By giving the party clearly defined and adequate power in legislation those schemes would make it impossible for the party to evade its just responsibility. The second group of reforms is less revolutionary in character and aims in general at the minimizing of the opportunities for corruption and illicit influence. Such are the rigorous corrupt practices acts and anti-bribery statutes, requirements of publicity in committee hearings, publication of campaign fund contributors, contributions, etc., and in other stages of legislative procedure rigorous laws forbidding or regulating lobbying.

Much valuable work is being done by various organizations, such as voters' leagues, which keep close watch of legislative proceedings and try to inform the citizens regarding the work which their representatives are doing. Little permanent reform can be expected unless it is supported by an alert and intelligent public sentiment.

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PARTY SYSTEM. See CONVENTION, POLITICAL; ELECTIONS; VOTE, VOTERS, VOTING; BALLOT; PRIMARY, DIRECT; PRIMARY, PRESIDENTIAL; CAUCUS; CONGRESS; and the parties by name.

PARTY-WALL, *in law,* is the wall that separates two houses or adjoining properties. Such a wall, together with the land upon which it stands, belongs equally to the owners of the two properties, half belonging to the one and half to the other; and unless the wall has stood for 20 or more years, each can legally do what he likes with his own half, even to cutting it away. It is common practice for the party who builds a house adjoining another to pay a just proportion of the expense of the party-wall to the party who built the same. By English common law, where the wall is, as above indicated, partly on both lots or properties, the adjoining proprietors are considered as tenants in common of the wall and of the land on which it stands. Neither owner of a party wall may legally extend the walls of his building further than the middle of the party wall, or maintain a window in the side toward the wall. If a party wall is destroyed, neither party can legally (in most States) rebuild same (except upon his own land) without the consent of the other party thereto.

PARVATI, pär'vą-tē, in Hindu mythology, a divinity; a daughter of the mountain, also called Durga (q.v.). The word itself in Hindu means "mountain born." She was said to be a reincarnation of Um, and she was called Parvati because she was a daughter of Himavat (Himalaya Mountains); or because simply, according to a later version or evolution of the myth, she was born in the mountains. When born she was white, red and black, the typical colors of Brahma, Vishnu and Siva from the combined glances of whom she was born. Later she divided herself into three forms which became respectively the wives of Brahma, Vishnu and Siva. Consult Wilkins, W. J., 'Hindu Mythology' (London 1900).

PARVIN, Theophilus, American physician: b. Buenos Aires, Argentina, 9 Jan. 1829; d. Philadelphia, 29 Jan. 1898. He was graduated at the University of Indiana in 1847 and took his M.D. at the University of Pennsylvania in 1852, whereupon he established himself in practice at Indianapolis. He was professor in the Medical College of Ohio in 1864–69, at the University of Louisville in 1869–72, and was subsequently professor of obstetrics and diseases of children at the Indiana Medical College and at Jefferson Medical College, Philadelphia. He was president of the Indiana State Medical Society in 1861, and of the American Medical Association in 1879. Author of 'The Science and Art of Obstetrics' (1886). Editor of 'Winchel on the Diseases of Women' (1887).

PARVISE, the open or enclosed space in front of a church or cathedral, especially in France. When the bishop held court he summoned delinquents to appear before him in the parvise, and at Saint Rhadegunda's Church at Poitiers the episcopal court at the west end of the church is well defined with five entrances, coped wall, kneeling angels and lions. At Amiens and Liseux the raised platform of the court still remains and traces of the same construction are apparent at Lichfield. The term is also applied to a room over the porch of a church which formerly was a watch house or lookout, but which in modern times has been applied to various uses.

PARZIVAL. Wolfram von Eschenbach's 'Parzival' is a Middle High German epic composed early in the 13th century. Its verse as a rule has four accents, two successive verses always being combined by a rhyme. It is divided into 16 books and in part (books 3–12) is based on the Old French 'Perceval le Gallois' by Chrestien de Troyes. But the latter remained a fragment, and Wolfram's poem excels it by greater depth of thought and feeling, and a higher standard of morals. Originally Parzival belongs to those simpletons popular in folklore who in foolishness and innocence accomplish some great deed. This old theme is remodeled and ennobled in our poem. The hero is endowed with that virtue which the Germanic peoples consider the highest — faithfulness, and he passes through a change of mind typically Christian in character which enables him to attain his aim. The aim itself is set high and is of a double character. In its worldly aspect it is represented by King Arthur and his followers (see special article) who hunt after glory and pleasure, who indulge in heroic deeds, the worship of women, adventures, festivals and the like. In its worldly and spiritual aspect it is represented by the king of the Grail and his followers who, while doing justice to the world, try above all to fulfil the highest commandments of God. The Grail (q.v.) symbolizes this ideal, and he who comes nearest to it is to be king of the Grail. Parzival first wants to become an Arthurian knight and then strives for the kingship of the Grail. Apart from its symbolic meaning, the Grail is with Wolfram a precious stone of miraculous power granting food at will and preserving the life of king Anfortas, if he looks at it. Its original connection with the Lord's Supper and Crucifixion can still be traced in Wolfram's poem. Book 1 and 2 deal with Parzival's parents, especially his father, Book 3 takes up the story of Parzival himself. His mother brings him up in a lonely forest, but the boy leaves her in order to become a knight. He first leads the life of a guileless adventurer until old Gurnemanz teaches him the noble laws of worldly knighthood. He wins the beautiful Kondwiramur for a wife and leaves her only in order to visit his mother. Unawares he comes to the castle of the Grail. There religious fervor and true humanity should make him ask about the wonders of the Grail and the sufferings of its king Anfortas. But regard for courtly manners controls his behavior, he suppresses the all-important questions and must leave the castle. It is true, he is afterwards received at the Round Table of king Arthur, yet on account of his behavior at the castle of the Grail he must withdraw also from the company of Arthur. Now Parzival quarrels with God because He allowed him to fall into disgrace, and sets out to win the Grail in spite of Him (Books 3–6). For years he roams about in vain, comforted only by his love for Kondwiramur. At last the hermit Trevrizent teaches him that man lives in sin and can not accomplish anything great unless called by God. In deepest humility and with a purified soul, Parzival resumes his faithfulness to God and not until now has he a chance to win the Grail (Book 9). This change in Parzival is depicted between the descriptions of the adventures of Gawain, a nephew of Arthur and first knight of the Round Table, who crowns his accomplishments by conquering the castle of the magician Klinschor and winning the love of the haughty Orgeluse, but who in spite of all his attempts fails to gain the Grail (Books 7–8, 10–13). With the 14th book Parzival comes again into the foreground. After he has defeated Gawain, he is received at the Round Table for a second time. In his half-brother Feirefis, he learns to admire pagan knighthood and is at last called to the Grail. Now he asks the decisive question about the sufferings of Anfortas. The latter recovers from his pain, Parzival is elevated to the kingship of the Grail and reunited with his beloved wife Kondwiramur. The expression in Wolfram's ‘Parzival’ is original and even peculiar, the thoughts have a tendency to mysticism, the outer world is given most of the space, and yet the spiritual element breaks forth in places with controlling power. For such and other reasons the poem is not easy to read. But it seems fair to say that before Dante's ‘Divina Commedia,’ no other poem of the Middle Ages has so much to say to the modern mind as Wolfram's ‘Parzival.’ Consult edition in ‘Deutsche National-Literatur’ (Vol. V, 1882–98); free, but excellent translation into Modern German with illuminating explanations and notes by W. Hertz (5th ed., Stuttgart and Berlin 1911); English translation by Weston, Y. L. (1894); Vogt, F., ‘Geschichte der mittelhochdeutschen Literatur’ (2d ed., pages 37–41, Strassburg 1902); Golther, W., ‘Die deutsche Dichtung im Mittelalter’ (pp. 206–224 and 578, Stuttgart 1912).

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PAS-DE-CALAIS, pă-dė-kă-lā, France, a northeastern department bordering on Dover Strait and the English Channel. Area 2,606 square miles, five-sixths of which are cultivable. Its coast, extending about 80 miles, presents a long tract of low sand-hills, but near Boulogne it forms a lofty crumbling cliff. The interior is generally flat, and intersected by canals; the streams, too, though short, are generally navigable. The principal harbors are Boulogne and Calais; the capital is Arras. The soil, though marshy in several places, is fertile, and produces cereals, vegetables and large oleaginous crops. Its chief minerals are indifferent coal, good pipe and potter's clay, and excellent sandstone. It has numerous iron-foundries, glass-works, potteries, tanneries, bleach-works, mills and factories of many kinds.

PASADENA, păs-ą-dē'ną, Cal., city in Los Angeles County, on the Atchison, Topeka and Santa Fé, the Los Angeles and Salt Lake and the Southern Pacific railroads, at the head of the San Gabriel Valley, 25 miles from the Pacific Ocean and nine miles northeast of Los Angeles. The Pacific Electric Railway connects Pasadena with neighboring cities, including Los Angeles, the Orange, Riverside and San Bernardino counties having one of the largest electric railway systems in the world. The city was settled by Spaniards in 1771. In 1873 a colony from Indianapolis, Ind., settled there and began raising fruit. In 1886 it was chartered as a city. Pasadena is a famous health and winter resort, on account of its equable climate and beautiful scenery. It is at the foot of the Sierra Madre range, which protects the city on the north and east, and on the west and south are broken ranges of high hills. It is surrounded with large fruit farms. Pasadena is a residential city, but its manufacturing establishments are substantial. They include large packing houses, drying establishments, canneries and flour mills, together with a number of smaller industries. Large quantities of fruit are exported annually. A unique feature of Pasadena is the «Municipal Farm.» Early in its history, the people recognized that the question of sewerage would have to be solved in some unusual way. Far from the ocean and surrounded by hills and mountains, only the wash of Arroyo Seco to depend on for drainage, it seemed as if the beautiful healthful city would soon become the home of disease. The city purchased a ranch of about 300 acres, six miles out, and by means of a large outfall pipe, the flow from the sewers was spread upon this land. About 60 acres were planted with walnut trees, and quite a large acreage was devoted to alfalfa. Enough alfalfa was raised to supply food for the horses of the fire and street departments, and left a large overplus for sale. The prominent public edifices are the churches, schools, hotels, and municipal buildings, and Pasadena Hospital. The educational institutions are the Throop College of Technology, the Pasadena Army and Navy Academy, Academy of Holy Names, Nazarene University, Stickney Memorial School of Fine Arts, high school, many fine public and private schools, and an extensive public library, which has seven branches in various sections of the city. In 1913 Pasadena adopted the commission form of government. The waterworks and electric light plant are owned by the city. Pop. about 50,000.

PASARGADÆ, pă-săr'gă-dē, ancient capital of Persia. The origin of the name is unknown. It was originally borne by one of the most important tribes of Persia to which belonged, according to Herodotus, among other important historical personages, Darius and Cyrus. Cyrus is reported to have built, after his final victory over Astyages, a town which he named Pasargadæ, after his own native tribe. And there he erected a palace and a magnificent tomb for himself. This historical fact led to the identification of the ancient city which stood upon the Plain of Murghab, some 40 miles northeast of Persepolis on the road forming the principal highway between Shiraz and Ispahan. The ruins are surrounded by the mountain barrier of the plain, which formed its chief protection against attacks from an enemy. At Pasargadæ the Persian sovereigns were invested with the insignia of office, in the sanctuary of the goddess of war. The city being the capital was rich in material wealth and art; and for that reason it was several times plundered. All this wealth was surrendered in 336 to Alexander, who on his return from India, finding the city had been plundered in his absence and the tomb of Cyrus treated in like manner, ordered Aristobulus to restore the latter. The description of the tomb given by Aristobulus at this time has made possible its identification with the tomb of the ruins of Murghab. The information furnished by the other historians of this period relative to Pasargadæ agrees with the account of it furnished by Aristobulus. It is quite possible that a town much older than the time of Cyrus existed on the site of Pasargadæ and that the conqueror enlarged and beautified it and made it his capital, at the same time changing its name. Among the striking buildings of the ruins of Pasargadæ is a massive stone platform or stone-crowned terrace, which bears the modern name of the «Throne of the Mother of Solomon» or sometimes «Solomon's Throne.» This is believed by some to have been a royal audience platform erected by Cyrus previous to his attempts to beautify the city. It may, however, have been used for religious ceremonies of a nature such that it was necessary that they should be performed in public where the assembled people could view them. In this case the platform structure may easily have belonged to the buildings of an older age than that of Cyrus. Not far away are the remains of an ancient temple, now known as «Solomon's Prison,» and near this are two altars with ruins of edifices. These are of stone and evidently were used in the ancient fire worship. South of these latter is the ruined corner of a once massive building on which is the inscription; «I Cyrus the King the Achæmenian» cut in cuneiform letters in Old Persian, Elamitic and Babylonian. A ruined building nearby bears the same inscription. This latter, a vast edifice, is now locally known as «Audience (or Reception) Hall.» In this pile of ruins is a shaft over 30 feet high made of limestone. By some this is supposed to have been the site of a former palace, probably dating to the time of Cyrus. Not far away is a huge limestone monolith, five feet broad, two feet thick and over 12 feet high, on the surface of which is carved a bearded figure supposed to represent Cyrus. The figure is crowned and is depicted with two pairs of wings. The cuneiform inscription that once crowned it leaves no doubt as to the meaning of the carving, for it reads, «I Cyrus the King of the Achæmenians.» This inscription was still in place during the first half of the 19th century and drawings and copies of it of that period are in existence. But the feature of the ruin in which most interest has centred is the «Tomb of Cyrus» already mentioned. This is a low stone, house-shaped building surmounting a six-tier terrace of stone, rising from a base 50 feet long by 40 feet wide. The summit of the monument is 35 feet above the ground; while the tomb proper is 18 feet high, 17 feet broad and 20 feet long. The whole is constructed of a very hard and fine limestone. Near this Tomb of Cyrus are the ruins of a building which was probably the temple and residence of the Magian priests, who were the guardians of the tomb. The identity of this tomb has been established beyond doubt through the descriptions and records left of it by persons in the train of Alexander who paid the place two visits. Consult Curzon, 'Persia and the Persian Question' (London 1902); Herzfeld, 'Pasargadæ Untersuchungen zur persischen Archäeologie' (Leipzig 1908); 'Iranische Felsreliefs' (Vol. II, Berlin 1910); Jackson, A. V. W., 'Persia Past and Present' (New York 1906); Sykes, 'History of Persia' (Vol. I, London 1915).

PASAY, pä'sī, Philippines, formerly Pineda, pueblo, province of Rizal, Luzon; six miles southwest of Pasig, the provincial capital. It is on the coast road. Upon application of the municipal council, the name of the town was changed from Pineda to Pasay by the Philippine Commission in 1901. Pop. about 15,000.

PASCAGOULA, păs'ką-goo'lą, Miss., city and county-seat of Jackson County, 38 miles southwest of Mobile, Ala., on the Pascagoula River and on the Louisville and Nashville and the Pascagoula-Moss Point northern railroads. The city is on an inlet of the Gulf of Mexico, which furnishes good anchorage; is in a productive fruit and lumber district; and has a fish and oyster industry. There are shipyards, and a United States government dock and naval machine shops. Pop. 3,379.

PASCAGOULA RIVER, a river of the State of Mississippi, formed in the southern part of Greene County by the junction of the Leaf and the Chickasawhay rivers. It flows south into Pascagoula Bay, Gulf of Mexico, through an estuary of two mouths. It is 250 miles long, is navigable for small steamboats for some distance, and is used as the outlet for the pine timber cut in the surrounding region for the New Orleans market.

PASCAL, pąs'käl', **Blaise**, French author and philosopher: b. in the old Auvergnat town of Clermont-Ferrand, 19 June 1623; d. Paris, 19 Aug. 1662. He belonged to a family connected with the magistracy, and his father and sisters were all of superior intellectual ability, just as Pascal himself proved to be one of the greatest and most comprehensive geniuses that the world has known. His mother died when he was a mere child. Pascal's intellectual precocity soon showed itself and extraordinary stories, perhaps exaggerated by affection and admiration, are told by his sister in her biography. However, in spite of a frail constitution and over-nervous temperament, he gave himself, as he grew up, not only to social diversions but to intense intellectual study, especially to mathematics and to physics. His sister declares that he composed a treatise on sounds at the age of 12; at 16 he wrote an essay on conic sections, and between 1640 and 1642 he invented an arithmetical machine.

In 1646, while living with his family at Rouen in Normandy, Pascal became converted to Jansenism after an accident to his father, during whose convalescence various Jansenist books were brought into the household. This conversion was, however, not a definitive one to a religious life. He undertook experiments on atmospheric pressure, wrote a study on the vacuum, had controversies with the Jesuits who denied its possibility, and in 1648 he conducted, with his brother-in-law Périer, important experiments simultaneously in Paris and in Auvergne to determine atmospheric weight. After the death of Pascal's father in 1651 he had a «worldly» period until about 1654, during which time he was intimate with people like the Duc de Roannez and the Chevalier de Méré. They were not mere men of fashion, but persons of experience and literary appreciation, who undoubtedly helped to transform Pascal's views from those of a secluded student, enlarging his appreciation of the different phases of life, and giving grace and smoothness to his style. Toward the end of this period he renewed many of his scientific experiments, worked at the theory of probabilities, invented the hydraulic press and certain other practical appliances, besides writing, in all likelihood, a treatise on love. Whether he himself actually went through an emotional experience is a matter of discussion. The now discredited carriage accident at Neuilly in which Pascal came near losing his life was placed in November 1654. But, whatever the reason, Pascal underwent a new crisis, partly under the influence of his sister Jacqueline who had become a nun in the Jansenist convent of Port-Royal. This is usually called his «second conversion.» He now felt the conviction of true faith, and in spite of physical suffering and mental anguish was happy in his sense of mystical insight into Christian belief. At once he stood forth as a defender of Jansenism. In 1656 he began the publication of the ‹Provincial Letters,› which are the climax of religious polemic, and during the rest of his life he was planning his unfinished masterpiece, published as his ‹Thoughts.› In his last years he bore with stoical firmness bodily pain increased by his ascetic mortifications, until his frail form already overburdened by his intellect gave way beneath the physical and mental strain. The transcendent name of Pascal appears in the annals of many branches of intellectual endeavor. To what has been recorded above in physics, religion and philosophy should be added his achievements ranging from the foundations of mathematical calculus to the first establishment of public omnibuses for the transportation of passengers. But it is in religious thought that his fame rests on the most popularly appreciated foundation. His scientific training led him, even apart from emotional tendencies, to sympathize with the determinism of the Augustinian Jansenists. His scientific achievements go to show that he did not disdain, as some people assume, the power of reason, but even as a man of science, his method was synthetic rather than rationally analytic as was the method of Descartes. Pascal distinguishes in his ‹Thoughts› between the *esprit de géométrie* and the *esprit de finesse*, the latter of which partakes of the spirit of synthetic feeling as intuition which often accomplishes so much that cold reason cannot reach. This tendency comes out strongly in Pascal's own religious views. He is ready to admit the help of the calculation of probabilities in coming to the conviction of God, but «the heart has its reasons (or arguments) that reason itself does not know,» and these are the direct knowledge, through faith, of the truth of religion. Consequently, Pascal is impatient at those who, like his early opponent the Frère Saint-Ange, relied on rational proofs alone. To him there was something supra-rational, which gave a truer insight and conviction. Incidentally we are also helped to understand why Pascal was willing to use the arguments of the sceptic Montaigne, who, like himself, sought to destroy the pride of reason, though without Pascal's ulterior purpose. The many sidedness of Pascal's philosophical genius has caused students to give him different descriptive epithets. Some have narrowly called him a pyrrhonist or sceptic like Montaigne, because of his destructive criticism of reason. Some have seen in him preeminently the pessimist; others the Christian stoic and ascetic. At all events he is the religious mystic and «fideist,» whose certainty was reached as much by argument as by conviction by miracles which he himself had witnessed, like the miraculous healing from disease of his own niece by the application of a thorn from the crown of thorns. Pascal has been called by some by his critics insane, but even the hard hearted cannot deny the dignity of his struggle against physical and mental suffering and the majesty of his victory. See PROVINCIAL LETTERS.

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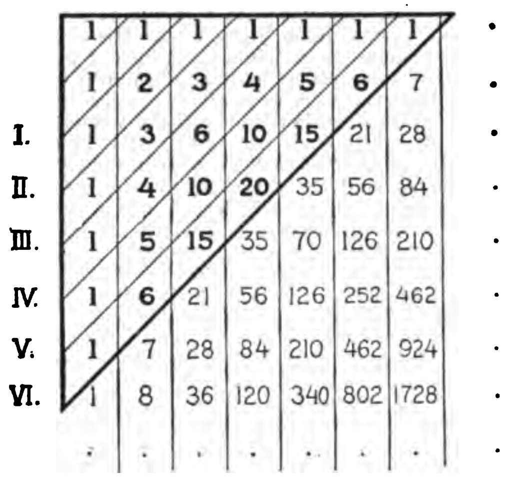
PASCAL'S TRIANGLE, also known as **FIGURATE NUMBERS,** *in mathematics,* certain series of numbers originally studied by the Chinese and by the Greek geometers in connection with geometric figures, especially polygons and pyramids and used by Pascal to determine the co-efficients of the expansion

$(a+b)^n$ whenever n is a positive integer. The arithmetical nature of the numbers will be seen from the following table:



	1	1	1	1	1	1	1	.
	1	2	3	4	5	6	7	.
I.	1	3	6	10	15	21	28	.
II.	1	4	10	20	35	56	84	.
III.	1	5	15	35	70	126	210	.
IV.	1	6	21	56	126	252	462	.
V.	1	7	28	84	210	462	924	.
VI.	1	8	36	120	340	802	1728	.
	.	.	.	.	.	.	.	.

The nth number in any row is here the sum of the first n numbers of the preceding row. The figurate numbers proper begin with the third row. The third, fourth, ... rows are called the first, second, ... series of figurate numbers. The table has the interesting property that its diagonals, extending upward from left to right contain the binomial coefficients, i. e., the coefficients in the expansions of

$$a+b,\ (a+b)^2,\ (a+b)^3\ .\ .\ .\ .$$

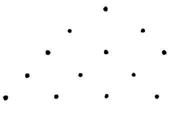
If instead of the natural numbers 1, 2, 3, ... which form the second row of the table above, we start out with series whose common difference is 2, 3, 4, ... we may form other sets of figurate numbers. Thus:

	1	3	5	7	9	. . .
I.	1	4	9	16	25	. . .
II.	1	5	14	30	55	. . .
III.	1	6	20	50	155	. . .
	.	.	.	.	.	. . .

or

	1	4	7	10	13	. . .
I.	1	5	12	22	35	. . .
II.	1	6	18	40	75	. . .
III.	1	7	25	65	140	. . .
	.	.	.	.	.	. . .

The name figurate, as already intimated, is derived from the fact that the series I and II are connected with arrangements of points in a plane or in space. Thus in the following arrangement, obtained by constant enlargement of a triangle,



the number of points in the successive horizontal rows is 1, 2, 3, 4, 5, ... and the total number in the first one, two, three, ... rows is 1, 3, 6, 10, 15, ... the series I of the first table. If the start is made from a square, instead of a triangle, the resulting numbers are 1, 4, 9, 16, ... being series I of the second table. In the same way series I of the third table corresponds to the case of a pentagon; and so on. The several series I are known as the triangular, square, pentagonal, ... numbers, and collectively as polygonal numbers. The series II corresponds in the same way to pyramids in space (e.g. piles of round shot), and are called pyramidal numbers. The general formula for the nth number of the polygonal series for polygon of r sides is

$$\tfrac{1}{2}[(r-2)n^2-(r-4)n];$$

the corresponding pyramidal number is

$$\tfrac{1}{12}n(n+1)[(2n+1)(r-2)-3(r-4)].$$

Consult Pascal, B., 'Traité du triangle arithmetique' (Paris 1665) and Maire, Albert, 'L'Œuvre scientifique de Blaise Pascal: Bibliographie critique et analyse' (ib., 1912).

PASCHAL I, păs'kạl (Latin, PASCHALIS, păs-kā'lĭs), **Saint**, Pope: b. Rome; d. 10 Feb. 824. He was abbot of Saint Stephanus and succeeded Stephen V in 817. He crowned Lothaire, son of Louis le Debonnaire, emperor in 823. Consult Mann, H. K., 'Lives of the Popes' (Vol. 2, London 1906).

PASCHAL II (RANIERO, rä-nē-ā'rō), pope: b. Bieda, Tuscany, about 1050; d. 21 Jan. 1118. A Cluniac monk, he came to Rome and was there made a cardinal. He succeeded Urban II in 1099, but was opposed for a time by the anti-pope, Clement III. He had a long contest with the Emperor Henry IV, and also with Henry I, king of England, respecting the right of investiture. When the former visited Rome, to be crowned by the Pope, the latter refused to perform the ceremony unless Henry yielded the matter in dispute. Thereupon Henry caused Paschal to be seized by his troops, but the Romans rose in behalf of their pontiff, and Henry retired from Rome, but carrying the Pope with him. After a captivity of two months, Paschal under pressure of durance, conceded in part the emperor's claim to the right of the investiture; but this concession was afterward canceled in two councils. Consult Franz, E., 'Papst Paschalis II' (Bresleau 1877); Monod, B., 'Essai sur la rapport de Paschal II avec Philippe I' (Paris 1907).

PASCHAL I, anti-pope: d. 692. He was a Roman archdeacon elected by a portion of the Roman populace and supported by the exarch of Ravenna in 687. Still another portion adhered to Theodorus II, but Sergius I was finally declared successor of Conon in the pontifical chair. Paschal was then pronounced a magician, arrested and shut up in prison where he died in 692.

PASCHAL III (GUIDO DI CREMA, gwē'dō dē krā'mä), anti-pope: b. Lombardy; d. Rome, 20 Sept. 1168. He was nominated in opposition to Alexander III in 1164, through the influence of the Emperor Frederick I (Barbarossa) and assumed the name of Paschal III. He continued in power while Alexander was absent at Benevento. He canonized Charlemagne at the request of Frederick, but this action was not ratified by the Church.

PASCHAL CHRONICLE (Lat. *Chronicum Paschale*, also *Chronicum Alexandrinum, Constantinopolitanum*, or *Fasti Siculi*), a chronicle named from being based upon the Easter canon, containing an outline of events from Adam to 629 A.D., arranged in chronological order. It is believed to be the work of a Byzantine author who compiled it in the reign of Heraclius (610–41), using earlier records, except that the last 30 years appear to have been written from a personal knowledge of contemporary history. The work has many faults and the earlier chronicles are imperfect but it nevertheless constitutes a valuable record. The manuscript copy in existence was made in the 11th century and is in the Vatican library. It was published in Dindorf's 'Corpus scriptorum historia byzantinæ' with a preface and commentary by Du Cange (1832); and in Minge's 'Patrologia græca' (xcii). Consult Gelzer, 'Sextus Julius Africanus und die byzantinische Chronographie' (1885); Van der Hagen, 'Observationes in Heraclii imperatores methodum paschalem' (1736): Krumbacher, 'Geschichte der byzantinischen Litteratur' (1897).

PASCHASIUS, păs-kā'sĭ-ŭs, **Radbertus**, or **RADBERT-PASCHASE**, French theological writer: b. Soissons, about 786; d. Saint-Riquier, 26 April 865. He entered the monastery of Corbie in 814, and subsequently became its abbot, a position he resigned about 851 in order to give his full attention to literary labors. He then retired to Saint-Riquier. He was a member of the Synod of Paris and in 849 he attended the Assembly of Chiersy in his capacity as abbot. Author of 'De Corpore et Sanguine Domini'; 'Exposito in Lamentationes Jeremiæ'; 'De Fide, Spe et Caritate'; 'De Partu Virginis' etc. A collected edition of his works was edited by Sirmond (Paris 1618).

PASCO, pä'skō, **Samuel**, American soldier and politician: b. London, England, 28 June 1834. His family emigrated to Prince Edward Island and finally settled in Massachusetts. He studied at Harvard University receiving his M.A. in 1872. From 1859–61 he was principal of the Waukeenah Academy. In the Civil War he served in the Confederate Army in the 3d Florida Volunteers and was wounded and captured at Missionary Ridge in 1863. After the war he resumed his position at the Academy and in the following year moved to Monticello, Fla., where he was clerk of the Civic Court. In 1868 he was admitted to the bar and began his political career. From 1876–88 he was chairman of the Democratic State Committee; was president of the Constitutional Convention of 1885; a member of the Florida legislature in 1887 and speaker of the house of representatives. In 1880 and 1908 he was a presidential elector, and served as United States senator from 1887–89. He was also a member of the Democratic National Committee 1880–1900 and of the Isthmian Canal Committee 1897–1905. From 1910–11 he was appointed commander of the Florida division of the U.C.V. with the title of major-general, and was then made honorary commander for life.

PASCO, a city in Peru. See CERRO DE PASCO.

PASCUAL LÓPEZ is the «autobiography of a medical student of Santiago» written by the Condesa Emilia Pardo Bazán. This work which appeared in 1879 belongs to that famous Spanish family of picaroon tales whose immortal ancestor 'Lazarillo de Tormes' furnished a model for so many European works. 'Gil Blas' is his cousin on the French side and «Cypriano» of Calderón's 'Mágico Prodigioso' is his Spanish prototype. Pascual, however, being a modern, does not sell his soul to the devil, but to a professor of chemistry who in the popular mind is on intimate terms with the «old 'un.» Pascual is one of the most finished rascals in literature. He is no moral prig who having mended his ways recounts in maturer years the escapades of his youth. He leaves us as unregenerate as he was when we first met him. A shiftless, stupid, ungrateful scapegrace he is, yet always winning. His elastic conscience permits him to borrow hard earned pennies with one hand and distribute easily won dollars with the other. His good angel «Pastora» seems many a time on the point of making Pascual a useful member of society, but all his attempts at reform are extremely short-lived. His language is full of picturesque student slang and smacks of the soil of Galicia. It is in the stories of her own Galicia when she is not preoccupied with naturalistic formulas that Pardo Bazán is at her best. Here she is mainly concerned with her story which is exciting enough to satisfy the most adventuresome taste. A critical estimate of this novel may be found in the collected works of Pardo Bazán. There is an American edition annotated by W. I. Knapp, published by Ginn and Company.

SAMUEL M. WAXMAN.

PASDELOUP, pą'd'-loo, **Jules Etienne**, French musical conductor: b. Paris, 15 Sept. 1819; d. Fontainebleau, 13 Aug. 1887. He was educated at the Paris Conservatoire, where he was awarded the first prize for solfège in 1832, and for piano in 1834. He founded in 1851 an orchestra whose members were gathered from the Conservatoire students and through his production of the best new compositions did much to awaken popular appreciation of them. In 1861 he began the popular Sunday concerts which he continued for 23 years, the government granting him a yearly subsidy of 25,000 francs. He was a member of the Legion of Honor.

PASENG, a Persian name of the male of the wild goat, whence have sprung the domestic races; the female is called «boz.» See GOAT.

PASHA, păsh'â, **BASHA**, a title of rank in Turkey; formerly an honorary title of a prince of the blood; latterly a title of the higher military and civil officials. The badge of the pasha was originally a horsetail waving from the end of a lance, which was crowned with a gold or silver ball. There are three military grades of pasha; and these are symbolized by the number of horse tails borne before the pasha on state occasions. Admirals and governors may have the title of pasha which is bestowed also upon other servants of the government, or rather of the Crown, by whom the honor is given and by whom alone it may be taken away. Originally a tail on the end of a lance was borne before the Mongolian chief as a sign of his rank and by way of a standard. Now three tails are the symbol of a general in chief; two tails, of a general; and one tail, of a brigadier.

PASHICH, PASHITCH or **PASITCH**, pä'shĭch, **Nicola**, Serbian statesman: b. Saitchar, 1846. He studied at Belgrade and at Zurich, afterward practising as an engineer. He fought in the Turkish War in 1876–78, and later became a leader of the Radical party. He was implicated in a plot against King Milan and was exiled in 1883–89, when he was permitted to return to Serbia. He later became mayor of Belgrade and in 1891–92 he was Prime Minister. He was Ambassador to Russia in 1893–94 and in 1899 was again convicted of plotting against King Milan, but was pardoned. He was Minister of Foreign Affairs in 1904–05 and Prime Minister in 1906–08. He was credited with piloting his country through the Austrian crisis of 1909 and was again appointed Prime Minister in 1912. He resigned in 1913 because of criticism concerning his Bulgarian policy, but was pursuaded to reconsider his decision and remain at his post. His ministry was overthrown in May 1914 but the opposition had not the strength to form a ministry and he was recalled. He was in office during the Austrian crisis of 1914, terminating in the European War and remained in power during the enforced flight of the government from Belgrade to Corfu and its return to Belgrade after the signing of the armistice.

PASHKOFF, päsh'kŏf, **Vasili Alexandrovitch,** Russian religious reformer: d. Paris, 8 Feb. 1902. He was a member of the Russian aristocracy, a colonel of the Imperial Guard and a personal acquaintance of Alexander II. In 1874 he became interested in the preaching of Lord Radstock and finally accepted that nobleman's views of Christianity. From that time he devoted his life to evangelical work, opened his palace to all classes for religious meetings at which he preached, and founded several organizations for religious study. He required none of those who accepted his views to leave the national church, but merely to live the simple life of early Christianity according to the principles of the Gospels. He devoted almost all his fortune to helping the poor and unfortunate. After the death of Alexander II who had favored him, his preaching was condemned as «prejudicial to the state»; his public meetings were prohibited and he was finally exiled. He continued his work in England, Austria, Rome and Paris till the time of his death and the «Pashkovski Sect,» which he had founded in Russia, still continued its work to a certain extent. He had a very large following in Russia. Consult *Eclectic Magazine* vol. 139, 3d series, pp. 344–350.

PASHT. See Bubastis.

PASIG, pä'sĭg, Philippines, pueblo, capital of the province of Rizal, Luzon; on the northwest shore of the Laguna de Bay at the mouth of the Marisquina River, eight miles east of Manila. It suffered considerable damage by fire and otherwise during the Filipino insurrection of 1897 and only a few of the stone houses remained standing. It is an important road centre and has a large trade. Pop. 25,000.

PASIG, the outlet of the Bay Lagoon (q.v.) into the Bay of Manila, at the city of Manila, length 10 miles. It has several important tributaries, is navigable for native boats and light craft and is the chief means of communication between Manila and the Bay Lagoon and the provinces on its shores.

PASINI, pą-zē'nĕ, **Alberto,** Italian painter: b. Busseto, near Parma, 1820; d. Turin, 1899. He began his career as a lithographer, but subsequently became the pupil of Theodore Rousseau and other artists at Paris and formed his style as a painter of Oriental genre in the course of travels through Turkey and Persia. He has also admirably caught Spanish atmospheric effects and customs. He was eminently successful in his chosen department of art and rivals the best French artists of the Oriental school in the brilliance and truthfulness of his pictures, a good specimen of which, ‹Entrance to a Mosque,› hangs in the New York Metropolitan Museum. His works differ very greatly from the tendency of the modern school of painting in that they are executed with great care and in fine and elaborate detail.

PASIPHAE, pą-sĭf'ā-ē, in Greek mythology, the daughter of Helios, the sister of Circe and the wife of Minos. Minos failed to perform certain vows and Poseidon caused her to become enamored of a bull. She was the mother of the Minotaur. See Dædalus; Minos and Minotaur.

PASKEVITCH, päs-kyĕ'vĭch, **Ivan Fedorovitch,** Count of Erivan, Prince of Warsaw, Russian field-marshal: b. Pultova, Russia, 19 May 1782; d. Warsaw, Russia, 1 Feb. 1856. He was a page at the court of Emperor Paul and in 1800 entered the army, where he rapidly won distinction and under Yermolaff in 1826 he waged such successful war against the Persians that he succeeded to the command in the following year. He conquered the fortified Armenian towns of Etchmiadzin, Nakhitchevan and Erivan and in 1828 concluded the peace of Turkmantchai. In 1828–29 he made two successful campaigns against the Asiatic Turks and took Kars, Erzerum and other strong places. He was made Count of Erivan and a field-marshal in 1830 and in that year crushed an uprising in Poland, where he was in command. In 1831 he succeeded to the chief command of the armies in Poland and though his rule was severe there was no uprising even in the troubles of 1848–49, when Paskevitch stopped the intervention of Hungary in behalf of the Poles by marching 200,000 men into Hungary itself. He succeeded to the command of the Russian army in 1854, but resigned after meeting reverses at Silistria. Consult Tolstoy, ‹Essai biographique et historique sur le Field-maréchal Prince de Vasovie (Paris 1885).

PASLEY, pä'slē, Sir **William Charles,** British general and military engineer: b. Eskdale Muir, Dumfriesshire, 8 Sept. 1780; d. London, 19 April 1861. He was educated at the Royal Military Academy at Woolwich and in 1797 was commissioned second-lieutenant in the Royal Artillery. He was transferred to the Royal Engineers in 1798 and served in Minorca, Malta, Naples and Sicily, reaching the rank of captain in 1805. He later served in the defense of Gaeta against the French and in Spain and Holland. He was in command of the Plymouth Company of Royal Military Artificers in 1811–12, and in 1812–41, he was director of the Royal Engineer establishment at Chatham. He was knighted in 1846 and became general in 1860. He was connected at various times with military schools, in the improvement of which he was deeply interested; and as a writer on military engineering he performed notable service to his profession. Author of ‹Essay on the Military Policy and Institutions of the British Empire›

(1810); ‹Military Instruction› (3 vols., 1814–17); ‹Practical Operations of a Siege› (2 vols., 1829–32); ‹Limes, Cements, Concrete, etc.› (1838), etc.

PASPALUM, a genus of grasses; the carpetgrasses. See GRASSES OF THE UNITED STATES.

PASQUE FLOWER, a hardy perennial herb (*Pulsatilla pulsatilla*) of the family *Ranunculaceæ*. It is a native of Europe in stony places and well drained soils, and has been introduced into gardens in cool climates as an ornamental plant. It is very hairy, bears tripinnately divided leaves upon slender stalks and blue or reddish-purple blossoms which are often more than two inches in diameter. Its name, «pasque,» is the old French for Easter, about which time it blossoms, a habit which has made the plant a favorite in old-fashioned gardens. Its petals are often used to color Easter eggs. Several other species of the genus have been called by this name, notably the American pasque flower (*P. patens*), common in low ground in the northern central United States.

PASQUIN, păs'kwĭn, **PASQUINO**, or **PASQUINADE**, a lampoon or short satirical publication, deriving its name from Pasquino, a tailor who lived in Rome in the 15th century. He was celebrated for his wit and satire. After his death a mutilated or broken statue was resurrected and placed near his shop, and on this were posted all satires, rhymes, libels, etc., hence the name pasquin or pasquinade. The Roman populace made use of these satires to express themselves in a manner that was prohibited by laws against the freedom of speech.

PASS CHRISTIAN, Miss., town in Harrison County, on Mississippi Sound, and on the Louisville and Nashville Railroad, 75 miles southwest of Mobile, Ala. It is one of the largest and most popular winter resorts on the Gulf of Mexico, the winter temperature averaging 60° F. It has a water front of over six miles, along which extends a shell-paved avenue, lined with magnolias and live oaks. There are also numerous promenading and fishing piers, and facilities for boating and bathing. It is in an agricultural and livestock raising region, and has a packing establishment and a large oyster business. Pop. about 2,500.

PASSAGLIA, päs-sä'yä, **Carlo**, Italian theologian: b. Lucca, 2 May 1812; d. Turin, 12 March 1887. He was educated at Rome, becoming a Jesuit at 15; in 1844 became professor at the Collegium Romanum. Four years afterward he was exiled from Italy by the expulsion of the Jesuits, but returned to Rome in 1849 and founded the ‹Civilità Cattolica.› In 1853 he published a three-volume defense of the dogma of the Immaculate Conception, in which he was a firm believer. But in spite of his orthodoxy his allegiance to the Pope faltered on the question of temporal power; in 1858 he left the Jesuit Order, aroused by the ideal of Italian nationalism, and attacked the position of the Pope in his famous letter, ‹Pro Causa Italica ad Episcopos Catholicos,› which was put on the ‹Index.› Passaglia left Rome and in 1861 became professor of moral philosophy in the University of Turin. His organ (1862–66), *Il Mediatore*, renewed the attack on the temporal power of the Pope. He was a member of the first Italian Parliament, in which he attempted to form a liberal Catholic party. Consult Biginelli, ‹Life of Passaglia.›

PASSAIC, N. J., city, in Passaic County, on the Passaic River, and on the New York, Susquehanna and Western, the Erie and the Delaware, Lackawanna and Western railroads, about 10 miles northwest of New York City. It was settled in 1692, and until 1852 was called Aquackanonk Landing. It was incorporated as a village in 1869 and in 1873 was chartered as a city. It is near the scene of several of the engagements of the Revolutionary War; Washington crossed the Passaic River at Aquackanonk Landing in 1776 when he was retreating through New Jersey. Passaic is both a manufacturing and a residential city. The good water power which was available had a great influence in attracting industries to the city, and the water is such as to be of great value in the bleaching and dyeing industry. Eighteen thousand persons are employed in the various industries, which have a capital of $48,000,000 and whose products are valued at $53,000,000 per year. The largest industry in the city is the manufacture of woolen and worsted, closely followed by cotton and linen. Passaic manufactures more textiles than any other city in New Jersey, and one-third of the handkerchiefs made in the United States. Other large industrial establishments are rubber works, silk mills, bleacheries and dye works, chemical works, belting and packing plants, leather and metal works. Twelve grade schools and one high school, recently erected at a cost of over $300,000, comprise the public school system. There are also five parochial schools and one private school. There are six parks in the park system, and all are being rapidly developed. Public playgrounds are maintained in the various parts of the city. The commission form of government has been in force since 1911. The assessed valuation in 1918 was over $50,000,000. Pop. 61,225.

PASSAIC, a river of New Jersey, which rises near Morristown, in Morris County, flows first south, then east on the line between Morris and Somerset counties, then northeast between Morris and Essex counties, crosses a corner of Passaic County and flows south into Newark Bay. It is about 100 miles long and navigable for small vessels as far as Passaic (about 11 miles). At Paterson there is a fall of 72 feet, about 50 feet of perpendicular descent. The extensive water power has been utilized for manufacturing, and by means of dams and canals has been distributed to many manufactories.

PASSAMAQUODDY (păs-ạ-mạ-kwŏd'ĭ) **BAY**, an inlet of the Bay of Fundy, forming a part of the boundary between Maine and New Brunswick, 12 miles long and eight miles wide at the entrance. It receives the waters of the Saint Croix River. It is deep, sheltered by several islands lying at the entrance and affords excellent harbors. The fisheries also are important. The rise of the tide averages 25 feet. Eastport, Maine, is on one of the islands at the mouth.

PASSAMAQUODDY INDIANS, an American tribe of the Algonquin family, residing in the vicinity of Passamaquoddy Bay and the Saint Croix River in Maine and in

New Brunswick. During the period of the colonial wars the tribe fought with the French. The word Passamaquoddy is said to mean the «place where there are plenty of pollock.» The people of this tribe who, in historical times at least, were never very numerous, belonged to the Abnaki confederacy and were linguistically very closely related to the Malecite. The Penobscot and Passamaquoddy tribes have in the Maine legislature a representative who is allowed to speak only on matters concerning the interests of the Indians of these two tribes, and especially of the reservations. There are from 400 to 500 Passamaquoddy Indians in the United States and a somewhat smaller number in Canada.

PASSAROWITZ, pās-sä'rō-vĭts, or **POSSCHAREWATZ,** pŏ-shä'rĕ-väts, Servia, a town, near the Morava, 10 miles south of the junction of the Morava and the Danube, at the foot of Sopot Mountain, and about 35 miles southeast of Belgrade. Pop. about 14,000. It is capital of an administrative department of the same name, with an area of more than 1,600 square miles and a population of 231,029. The city was the scene of negotiations for a peace between Turkey on one side and Austria and Venice on the other, 21 July 1718, by which Austria got Temesvar, Belgrade and part of Servia, Venice's rights in Herzegovina, Albania and Dalmatia were recognized, and the Morea was restored to Turkey. Passarowitz was captured by the Germans in 1915.

PASSAU, păs'sow, Germany, a town of Lower Bavaria, in a mountain defile at the confluence of the Ilz, Inn and Danube, 91 miles by rail east-northeast of Munich. It stands on the southeast frontier of the kingdom and consists of four parts — Passau proper, on the tongue of land between the right bank of the Danube and the left bank of the Inn; Innstadt, on the right bank of the Inn; Anger, a suburb on the left bank of the Danube, adjoining it Oberhaus, a fort strongly situated on a height 417 feet above the river; and Ilzstadt, also on the left bank of the Danube, but likewise traversed by the Ilz. Intercommunication is provided by numerous bridges. The principal buildings are the cathedral, a handsome modern structure in the Italian style, with a bell-shaped cupola; the bishop's palace; church of Saint Michael; the Jesuit College, now converted into a lyceum; the town-house, gymnasium and library, the school of agriculture and the Training School for Teachers. The manufactures consist of iron, copper and earthenware, porcelain, crucibles. There are also several extensive breweries. Passau is an old town and is famous for the treaty signed in 1552, when Charles V., intimidated by the victories of Maurice of Saxony, was compelled to recognize the Protestants and to grant them religious toleration. Pop. about 22,000.

PASSAVANT, pä-sä-väṅ, **William Alfred,** American Lutheran clergyman: b. Zelienople, Pa., 9 Oct. 1821; d. 3 June 1894. He was graduated from Jefferson College in 1840, from the Lutheran Theological Seminary, Gettysburg, in 1842, was ordained in the same year and accepted a pastorate in Baltimore, Md. He was in charge of a parish in Pittsburgh 1844–55, after which he devoted himself entirely to editorial and philanthropic work. He founded numerous hospitals and orphanages in different cities and, co-operating with A. Louis Thiel, founded in 1870 Thiel College at Greenville, Pa. He labored assiduously to secure funds for these institutions, collecting, it is estimated, over $1,000,000 for them. The Order of Deaconnesses was introduced by him into the United States. He edited the *Missionary* at Pittsburgh (1845–61) till it was merged with the *Lutheran,* of which he was coeditor, and in 1880 he founded the *Workman* at Pittsburgh, of which he was editor until his death. Consult Gerberding, G. H., 'Life and Letters of W. A. Passavant' (Greenville, Pa., 1906).

PASSÉ (pä-sä) **INDIANS,** a South American tribe of the Arawakan family, formerly very numerous in northwestern Brazil, but now as a tribal organization nearly extinct through absorption into other tribes and crossing with the whites. The race is noted for handsome figures, fine features and bright complexions, nearly approaching the Caucasian type. They have a powerful native priesthood and bury their dead in circular graves. They have always been friendly to the whites and are a peaceful, industrious race. Many of them lived in the mission villages in the 18th century.

PASSENGER PIGEON, the American wild pigeon (*Ectopistes migratorius*), so named from its former conspicuous habit of passing from one part of the country to another in immense flocks. These movements were not migratory in the proper sense of the term, however, except in the northern parts of the birds' range, but were movements *en masse* in search of food. These birds were resident throughout the year south of Canada and the most northern States, which they were compelled to leave in midwinter when the ground was covered with snow. Early travelers and observers astonish us by their accounts of the immense numbers of these pigeons which used to move about the forested interior of the country previous to its general settlement, statements confirmed by records and recollections of men still living. Audubon once computed that the continuous stream of pigeons he saw on one of many occasions included more than 1,100,000,000 birds, and would consume more than 8½ million bushels of grain daily.

These enormous numbers do not appear to be at all exaggerated from the actual details of the case. Wilson similarly calculated that a flock observed by him was 240 miles long, and numbered 2,230,272,000 pigeons, while the food-supply was estimated at 17,424,000 bushels of grain a day.

In fact, however, grain became the food of pigeons only after fields of rice, wheat, oats, etc., began to be planted, and never formed an extensive part of the feed, since the birds did not settle upon and attack the growing or ripening fields, but only gleaned among the stubble. Their food consisted mainly of the smaller acorns and thin-shelled nuts, especially beechnuts, and a variety of berries and small fruits; and where such material was plentiful they gathered in vast congregations, which thronged upon the trees, until branches would break with their weight, and covered the ground so thickly, turning over the leaves in search of something to eat, that the moment one rose upon the wing another was ready to take its place. The pigeons would remain at such «roosts» as long as the food-supply held out, and in May or early June would make their nests in company, sometimes so loading the trees that they would break down. The nests were rude platforms of twigs, holding two roseate white eggs, or sometimes only one.

Such congregations were more often seen in the Great Lakes region than elsewhere, and there, in the first two-thirds of the 19th century, settlers would gather and kill or catch the birds in great quantities, while the wild carnivorous animals from far and near would assemble to the feast. At first the killing was done only for home needs, each family perhaps salting a few barrels of the bodies; but later, when transportation facilities improved, large numbers were taken and packed for sale elsewhere; and other large numbers were capturd alive especially of the young, by being tolled into pens by spreading food, and then transferred to other enclosures, where they were kept and fattened for market. Men made a business of this, going from place to place wherever pigeons abounded, and sometimes capturing 200 dozen or more in a day. Audubon records that in 1805 he saw schooners at the wharves in New York city loaded in bulk with pigeons caught up the Hudson River and sold for one cent each. In addition to this market use, a very large demand arose among so-called sportsmen for pigeons to be shot at when released alive from spring-traps merely as an amusement and test of marksmanship. As many as 20,000 were used on a single occasion in some «tournaments» before this reprehensible form of recreation could be prohibited by enlightened public sentiment crystallized into law. This incessant slaughter and persecution, together with the clearing away of large acres of forest, rapidly destroyed the pigeons, the disappearance of which was greatly hastened by a series of very cold winters and late, stormy springs between 1860 and 1870. Under the protection of the game laws the bird seems gradually becoming more numerous in its old haunts, and may revive in considerable numbers, since food remains abundant for it, and natural enemies are diminished.

The passenger pigeon has a total length in the male of 17 inches, one-half of which belongs to the narrow, gracefully pointed tail. The female is much smaller. The upper parts generally are a variable blue, the neck richly glossed with metallic golden violet, and the lower purplish or brownish red, fading behind into a violet tint, nearly white beneath the tail. The wing-quills are blackish, with a bluish border, and the wing-coverts obscurely spotted. The middle ones of the 12 tail-feathers are brown, the others pale blue on the outer web and white on the inner web. The wings are long (eight and one-half inches) and pointed, and the flight of the bird remarkably swift and powerful, rivals that of the homing pigeon, which in general this bird resembles as a type of the *Columbidæ*.

This species was never known west of the eastern border of the plains, but originally occurred through all eastern North America as far north in summer as Hudson Bay.

Consult Wilson, Audubon, Godman, Nuttall, DeKay, Richardson and early American writers generally; and Baird, Brewer and Ridgway, 'Birds of North America' (1874) and Mershon, W. B., 'The Passenger Pigeon' (New York 1907); Stewart Baker, 'Indian Pigeons and Doves' (London 1913). See PIGEON.

PASSENGERS. See COMMON CARRIER.

PASSERES, or **PASSERIFORMES,** a group of birds comprising over half of all classified birds. In its subdivisions of families, genera, species and subspecies, it embraces the greater number of the small, familiar and predominantly migratory or passing birds, more or less related to the ordinary house sparrow. See ORNITHOLOGY.

PASSI, pās'sē, or **PASSY,** Philippines, town, province of Iloílo, island of Panay, at the junction of the Malínao and Jalaur rivers; 25 miles north of Iloílo, the provincial capital. Pop. about 15,000.

PASSING-BELL, the bell sometimes rung to call for the people's prayers for the dying in their hour of agony. The usage of tolling a bell while the soul is said to be «passing» from earth is at least as old in England as the days of the Venerable Bede (673–735), who tells us that at the death of Saint Hilda, one of the nuns of a distant convent, as she was sleeping thought she heard the sound of the passing-bell calling her and her companions to prayer.

PASSINI, pä-sē'nē, **Ludwig,** Austrian painter: b. Vienna, 9 July 1832; d. 1903. He was the son of the copper-plate engraver, Johann Passini, and under his father's direction pursued his art studies at the Vienna Academy. In 1850 he went with his parents to Trieste and later to Venice, where he devoted himself to painting in water-colors. In 1855 he took up his residence in Rome and began his series of architectural pictures, and interiors with figures. From 1873 he lived at Venice, and the brilliant aquarelles which he there executed reveal a remarkable talent for delineating racial types and a profound sympathy with the life and spirit of the common people. His masterly technique has commanded the admiration of critics and been the model and inspiration of younger artists. He discovered artistic beauties in Venice, which other artists had passed by unnoticed, and he was largely instrumental in making them known. He was also a good portrait painter. Among his principal works are 'The Choir of Saint Peter's Church' (Berlin National Gallery); 'The Catechism'; 'The Girls' School'; 'Vespers in Saint Paul's at Rome.' He has also painted some clever portraits in water-color, notably that of the Empress of Austria. He is undoubtedly the first water-color painter of his country. 'The Tasso Reader'; 'Pumpkin Vender' (Vienna Museum); 'Curious People on a Bridge' (Breslau Museum); 'Mass at Chioggia' (Metropolitan Museum, New York).

PASSION, suffering, applied especially to the sufferings of Jesus, which are solemnly commemorated by Christian churches every year. Good Friday is the anniversary of the crucifixion, as Easter Day is of Christ's resurrection, these days being led up to by the whole season of Lent (q.v.), the seven and a half weeks preceding Easter (q.v.).

PASSION CROSS, a form of the Latin cross having a long stem and short traverse near the top, supposed to present the proportions of the cross upon which Christ suffered. It is used in Christian churches, and in the Roman Catholic Church often bears a representation of the figure of Christ. A passion cross elevated three steps, or degrees, is called a cross of Calvary; the three steps being explained by heralds as signifying hope, faith and charity.

PASSION FLOWER, a plant of the genus *Passiflora,* of the family *Passifloraceæ.* The species, of which about 100 have been described, are mostly natives of tropical and subtropical America, a few extending as far north as Pennsylvania, and a few natives of the Australasian Archipelago. The great majority are vines, but some are herbs, shrubs and trees. They are characterized by variously lobed, simple, alternate leaves with axillary tendrils; and perfect flowers of remarkable shape and often of high coloring, though green and yellow are the prevailing tints. The early Spanish settlers in America are responsible for the popular name of these plants. They fancied the flower to typify the passion of Jesus; the 10 colored parts of the floral envelope being supposed to represent the apostles, with the exception of Peter and Judas Iscariot; the showy corona of filaments suggesting the crown of thorns, or, to some, the halo; the five stamens typifying the wounds in Jesus' hands, feet and side; the three styles representing the nails, and the column from which the stamens and pistil arise, the pillar used in the scourging. Other parts of the plant were similarly treated, for example, the pointed leaves symbolized the spear-head, and the tendrils, the cords. (Consult Folkard, 'Plant Lore, Legends and Lyrics).

A large number of the species are cultivated in greenhouses. They are graceful in foliage, and their large, often showy flowers, borne singly in the axils of the leaves or in axillary racemes, are valued as curiosities. They vary in their ease of propagation and cultivation, some being easy to raise from seed, some from cuttings, etc. Several are hardy out of doors as far north as Washington, D. C., others tender even in the Gulf States.

Among the best known are *P. incarnata,* popularly called Maypop, and *P. lutea.* The former is a well-known weed from Pennsylvania southward and westward; the latter from Pennsylvania southward. Both are cultivated for ornament in gardens and greenhouses. The fruit of maypops is edible. *P. quadrangularis* is a tropical American species commonly called granadilla. Its fruits are highly prized in the West Indies and southern Florida. Several other species bear edible fruits; for example, *P. edulis,* sometimes erroneously called granadilla; *P. laurifolia,* the water lemon or Jamaica honeysuckle; and *P. alata;* all South American species.

PASSION MUSIC, the musical rendering of certain portions of the Catholic Church's liturgy in the week preceding Easter, now called, but improperly, by non-Catholics, Passion Week, its proper name being both in the Latin and the Eastern church Holy Week — *Hebdomas* (or *Septimana*) *sancta, major,* etc., and *ἑβδο μάς ἁγία, μεγάλ,* etc. In the calendar of the Latin Church, Passion week is the week which begins with Passion Sunday (*Dominica Passionis*), the fifth Sunday of Lent: the sixth Sunday is Palm Sunday (*Dominica in Palmis,* *ἑορτὴ τῶν βαΐων*) in the Latin and Greek churches. On that day the history of our Lord's Passion, as recounted in the Gospel of Matthew, is chanted alternately by three clerks in holy orders, one rendering the narrative portion (*evangelista*), another the words spoken by Jesus (*Christus*), the third those spoken by the apostles, the high priests, etc. In the afternoon or evening of the Wednesday, Thursday and Friday of Holy Week the office of Matins and Lauds is chanted, the most striking feature of the musical service being the rendering, on Holy Thursday and Good Friday, of the Lamentations of the Prophet Jeremiah in most appropriate plain-chant melodies; this service is called *Tenebræ* because by gradual extinguishment of all the lights the interior of the church is left in darkness. In the morning service of Holy Thursday (Maundy Thursday) is chanted the hymn of triumph,

> Pange, lingua, gloriosi corporis mysterium,
> Sanguinisque pretiosi quem in mundi pretium
> Fructus ventris generosi Rex effudit gentium.

On Good Friday, in the morning service, the history of the Passion according to Saint John is chanted. Deeply impressive, in the service of this day, is the dramatic rendering of the *Improperia* or «reproaches» of Jesus to the Jewish people, while the clergy and people are doing reverence to the representation of the Crucified: «*Popule meus, quid feci tibi? aut in quo contristavi te,*» etc.— «My people, what have I done to thee, or wherein have I vexed thee?» and this strophe of one chanter is taken up by a second with: «*Quia eduxi te de terra Ægypti parasti crucem salvatori tuo.*» After each *improperium* one choir chants, in the Greek language, «Holy God,» to which a second choir responds «Holy God» in Latin: then alternately in Greek and Latin the two choirs chant «Holy Strong,» «Holy Immortal, have mercy on us.» In the morning service of Holy Saturday the grand prose composition, *Exultet,* is sung to the finest melody in the whole repertoire of church music.

PASSION-PLAY, a species of mystery-play which was exceedingly popular in the Middle Ages. It was acted in Holy Week. Such plays were frequent in Provence, northern France and Italy, Spain, Portugal and England. After the Reformation they were repressed in Germany excepting in those regions where the population still remained faithful to the Roman Catholic Church, that is, in Bavaria, the Tyrol and the Salzburg Alps. In the 18th century Carl Theodore and King Maximilian Joseph I forbade the performance of such mysteries in Bavaria, making an exception in the case of the villagers of Oberammergau, where the play had been enacted since 1633. These villagers had escaped contagion from the plague that was raging in their neighborhood, and made a vow to perform such a play every 10 years. This they have done and their representation of the drama has drawn thousands of visitors from all parts of the world. There are about 600 performers and the character of Christ is taken by a man remarkable for his religiousness and sanctity of life. The passion-play was introduced into Spanish America by the Spaniards; and still rude passion plays may be seen in several Latin-American countries to-day. Even at the beginning of the 20th century an Indian version of the passion-play was a feature of the life of several Mexican towns. In such plays all the actors were Indians. Consult Grein, 'Das Oberammergauer Passionspiel' (1880); Stead, 'The Passion Play' (1890).

PASSION WEEK, the week before Holy Week, which latter is the last week in Lent, and was styled by the primitive Christians the «Great Week.»

PASSIONATE PILGRIM, The, a collection of 20 sonnets published in 1599 by W. Jaggard and attributed to Shakespeare. Of the total number only five, however, are clearly proved to be Shakespeare's, others being by Barnfield, Marlowe and Raleigh. The authorship was for a time undisputed but in later editions Shakespeare's name was withdrawn from the title page.

PASSIONISTS, a very ancient order of monks under the jurisdiction of the Roman Catholic Church. See ORDERS, RELIGIOUS.

PASSOVER (Hebrew *pesach,* Aramaic *Pascha,* a sparing), the Jewish feast to commemorate the sparing of the Israelite first-born and the escape out of Egypt. It falls on the first full moon of the spring, from the 14th to the 21st of the month Nizan. (See EASTER). At this festival the Israelites, while they remained in possession of Palestine, assembled in the tabernacle, and from Solomon's time in the temple. During the eight days of the feast they were commanded to eat only unleavened bread, because their hasty departure from Egypt obliged them to take their dough with them unleavened; hence the name of «Feast of Unleavened Bread.» Every family ate, on the evening of the first day, a lamb roasted whole and served up without breaking a single bone. Offerings of firstlings of the flocks and herds, and first-fruits, were presented in the temple. The Passover was and indeed with the orthodox Jews still is the principal Jewish annual festival. The Seder is the great Jewish family reunion of the year. Wherever the traveler may be the rest of the year, his mind rests not in the spring until he is safely home again, so he may take part in the Seder around the family table.

The master of the house occupies the seat of honor at the head of the table. He is clothed in his best, over which he wears his white linen death shroud — the Kittel. A skull-cap of silk or velvet covers his patriarchal head, and he rests his arms on soft pillows enclosed in shams of immaculate whiteness. At his right sits his wife — at his left his eldest son; guests, sons, daughters and servants, if there be any, occupy the remaining seats at the table, and symbolize the equality of all, before man and God, and commemorate the one time slavery of all Israel. On the table directly in front of pater-familias is a plate on which three flat cakes — known as matzoth, are placed, each covered with a spotless white cloth or napkin. Close at hand is a dish which contains a portion of the shoulder or the shank of a lamb, with a small bit of meat attached, roasted on the coals almost to the point of charring. In this dish one may also observe an egg, peeled of its shell, that has been roasted hard in hot ash. A third dish contains a goodly portion of horseradish or other bitter herb, and a fourth holds the Charoseth — a cement-like paste made of nuts, apples, raisins and spices of various kinds.

Each of these dishes has its peculiar significance. The number (three) of the cakes signifies the three national divisions: Priests, Levites and Israelites. The matzoth represent the unleavened dough which the Israelites carried with them on their flight out of bondage; the shank-bone or shoulder blade represent the paschal lamb — which was by far the most important feature of the Passover in the days of the temple; the bitter herbs stand as a reminder of the bitter days of slavery in the kingdom of the Pharaohs.

These preliminaries having been properly set in place, the ceremony proper begins. The hands are washed and various blessings are recited appropriate to the occasion. The master of the house, breaking one of the three matzoth in two, and pointing to the roasted bone and egg, lying before him, recites in Chaldaic, «Lo! this is the bread of affliction, which our forefathers ate in the land of Egypt; let all those who are hungry enter and eat thereof; and all who are in need, come, and celebrate the Passover.»

The youngest male member of the family then asks the classic «four questions,» the head of the house and all those about the table reply, in Hebrew or in English: «Because we were slaves unto Pharaoh in Egypt, and the Eternal, our God, brought us forth from thence with a mighty hand and an outstretched arm; and if the Most Holy had not brought forth our ancestors from Egypt, we, and our children, and our children's children, would still continue to be slaves to the Pharaohs in Egypt.»

As the story of the Exodus rolls on, each of the various dishes is taken in turn, and its significance explained in picturesque language. A portion of the Hallel is next recited, and the reply closes with a benediction, in which is expressed the hope that the Holy Temple will be rebuilt and the ancient rites and sacrifices restored. The hands are again washed, and after pronouncing grace over the matzoth, the meal proper is served.

The first celebration of the Passover was on the eve of the departure of the Israelites from Egypt. A second celebration in the second year afterward is recorded in the ninth chapter of the book of Numbers. Further celebration was enjoined until the wanderers had reached the land of Canaan — which was 39 years later.

In the days of the Second Temple this festival was observed in a most elaborate manner. In the year 65 A.D., we are told, 3,000,000 Jews visited Jerusalem for the celebration of the Passover, and in the days of Nero at the Passover celebration 265,500 lambs were slain, also indicating an attendance of nearly 3,000,000 Jews. The city could not accommodate all that came from far and near. Tents were accordingly thrown up outside of the city walls. The Roman authorities, fearing the spread of sedition during these days, took extraordinary police precautions to prevent political disturbances.

The Passover celebration of to-day differs, of course, from that of 2,000 years ago; yet it differs only in so far as the changed civil and economic conditions have had their effect on Jewish life. The sacrifices are not made and the journey to Jerusalem is not undertaken, for the Temple has been destroyed these many centuries. Nevertheless, apart from these features, the celebration of the Passover by the orthodox does not differ materially from the Passover as it was celebrated by Jesus and his disciples and the Jews before his day.

PASSOW, pās'sō, **Franz Ludwig Karl Friedrich,** German philologist: b. Ludwigslust, Mecklenburg, 20 Sept. 1786; d. Breslau, 11 March 1833. He was educated at Gotha and Leipzig, in 1807 was Greek professor at Weimar, and in 1815 became professor of ancient literature at Breslau; in 1829 director also of the museum of art there. His 'Greek-German Lexicon' (1819–24) formed the basis of Liddell and Scott's 'Greek Lexicon.' Other works of his are 'Turnziel' (1818); 'Elements of the History of Greek and Roman Literature and Art' (1816). Consult Sandy, J. E., 'A History of Classical Scholarship' (Vol. III, Cambridge 1908); Wachler, 'Passows Leben und Briefe' (1839).

PASSPORT, a warrant of protection and permission to travel granted by a competent authority to persons moving from place to place. In some European states no person is allowed to leave the country without a passport from his government giving him liberty to do so; and passports may be even required by the natives when they travel from one part of the country to another. In the United States the only species known are foreign passports. The regulations put in force regarding passports by different countries have naturally differed greatly at different times, as during a time of war or internal disturbance compared with a time of peace; and while persons coming from one country may have to provide themselves with passports, citizens of another country may be freely admitted. It is of advantages to be provided with a passport even in countries where it is not demanded, as it furnishes a proof of the bearer's identity and nationality. In the United States passports, with description and portraits supplied by the applicant, are issued by the State Department at Washington. They are good for two years from date, renewable by stating the date and number of the old one. The fee required is one dollar. They are issued only to citizens, native-born and naturalized and the application must be supported by an affidavit of at least one credible witness who has known the applicant at least two years, stating that the applicant is the person he represents himself to be and that the facts stated in the application are true to the best of the witness's knowledge and belief. When the applicant is accompanied by his wife, minor children and maid servant, who is a citizen of the United States, it will be sufficient to state the fact, giving their names in full, the dates and places of their birth and the allegiance of the servant, when one passport will suffice for all. In such case, however, three photographs of each person should accompany the passport application. For a man servant or any other male in the party a separate passport will be required. For a woman, if she is unmarried, in addition to the ordinary statements, she should state that she has never been married. If she is the wife or widow of a native citizen of the United States, the fact should be made to appear in her application which should be made according to the form prescribed for a native citizen, whether she was born in this country or abroad. A married woman's citizenship follows that of her husband. It is essential, therefore, that a woman's marital relation be indicated in her application for a passport, and that in the case of a married woman her husband's citizenship be established. A woman's passport may include her minor children and maid. Application forms are furnished by the State Department free of charge.

PASSY, Frédéric, French political economist and statesman: b. Paris, 20 May 1822; d. 12 June 1912. He was educated for the law but practised but a short time before accepting an appointment as auditor to the Council of State in 1846. He withdrew from politics after the coup d'etat of Napoleon III. He was one of the founders of the International and Permanent League of Peace in 1868 and became its permanent secretary. He served in the Chamber of Deputies in 1881–89; and in 1881–1902 he was professor of political economy in several colleges. He was associated with Sir. W. R. Cremer in forming the Interparliamentarian Union for Arbitration and Peace; and was a member of the International Bureau of Peace at Bern, Switzerland. He was elected to the Academy of Moral and Political Sciences of the French Institute in 1877; was a commander of the Legion of Honor; and in 1901, he, with Henri Dunant, received the first Nobel Peace Prize. He was president of the Society of Political Economy for 70 years. Author of 'Mélanges économiques' (1858); 'De l'Enseignement obligatoire' (1859); 'La Guerre et la Paix' (1867); 'L'Histoire et les sciences morales et politiques' (1879); 'Historique du mouvement de la paix' (1905), etc.

PASSY, pā-sē, France, a western suburb of Paris, since 1860 incorporated with the city. See PARIS.

PAST AND PRESENT, a work by Thomas Carlyle, published in England in April 1843 and in May in the United States. It was written in seven weeks, as a respite from the harassing labor of writing 'Cromwell.' In 1842, the Camden Society had published the 'Chronicles of the Abbey of Saint Edmund's Bury,' written by Joceline de Brakelonde, at the close of the 12th century. This account of a mediæval monastery had taken Carlyle's fancy; and in 'Past and Present' he contrasts the England of his own day with the England of Joceline de Brakelonde.

PASTA, Giuditta, joo-dēt'tā pās'tā, Italian opera singer: b. Saronno, near Milan, 9 April 1798; d. Lake Como, 1 April 1865. Her maiden name was Negri, her ancestry was Jewish and her first attempts on the stage after her leaving the Conservatory of Milan met with little success. She married a tenor named Pasta in 1816, studied for a time with Scappa and made her first successes in Venice, Rome and Milan in 1819–20. At Paris she introduced the arpeggio embellishments to Rossini's music, which added much to her artistic fame. She made her first appearance in London in 1824, playing alternately there and in Paris. For 10 years her voice steadily improved and even when it began to grow weak her dramatic ability was still crescent. As late as 1850 she sang in England and her voice was said to retain much beauty when she was 60; but as has been suggested, her fame is due principally to her remarkable combination of fine singing and classic acting. Bellini wrote ‘Sonnambula’ (1831) and ‘Norma’ especially for her; the same is true of Donizetti's ‘Anna Bolena.’ Among her other favorite roles were Romeo in Bellini's ‘Romeo e Giuletto,’ Desdemona in Rossini's ‘Otello’ and Nina in Paisiello's opera of that name.

PASTEL, *in art,* a colored pencil of pipeclay, gum water and the required pigment. The executed work is also called a pastel or a drawing in chalk. See CRAYON; PAINTING, TECHNIQUE OF.

PASTERN, that part of the leg of a horse between the «fet-lock» joint next the foot and the coronet of the hoof. The first phalanx of the foot is called the great pastern bone; the second, the small pastern or coronary; the third, the coffin-bone, which is enclosed in the foot.

PASTEUR, päs-tėr, **Louis,** French chemist: b. Dôle (Jura), 27 Dec. 1822; d. Villeneuve l'Etang (Seine-et-Oise), 28 Sept 1895. He was educated at the Royal College of Besançon and the Ecole Normale of Paris from which he was graduated in 1847. The following year he became professor in the Lycée at Dijon, in 1849 professor of chemistry at Strassburg and in 1854 dean at Lille of the scientific faculty, which he organized. In 1857 he was made director of scientific studies in the Ecole Normale, in 1868 director of the chemico-physiological laboratory at the Ecole des Hautes Etudes and in 1887 permanent secretary of the Academy of Sciences. In 1889 he withdrew from all other posts to give his entire attention to the management of the Pasteur Institute, built by popular subscription for the prosecution of research in the preventive treatment of infection. His first investigations, which aroused the wonder of the veteran chemist Biot and placed him high among the scientists of the time, had to do with optically active and inactive substances. His examination of two tartaric acids, one of which turned to the right the plane of a ray of polarized light while the second remained inoperative, proved that the inactivity of the latter was due to its being composed of two isomeric acids which diverted the ray with equal power in opposite directions. In his subsequent work, Pasteur applied these exacting methods of research, chemical and physical, to the solution of several complex phenomena. Fermentation had not then been explained. Pasteur showed that the various changes involved in the process were the result of the presence and growth of a micro-organism which he called the ferment. He was thus the founder of the science of bacteriology (q.v.), as he had previously been of stereochemistry (q.v.). He proceeded to demonstrate that the varieties of fermentation were due each to a special organism, and that when these atmospheric germs were absolutely excluded no change took place. These discoveries proved of great service to the industries of brewing and winemaking, in which they substituted scientific certainty for guesswork. To prevent the deterioration of wines and beers, as also of milk, a process of heating, known as «Pasteurization,» was introduced and a large financial loss was avoided. In 1865 Pasteur began the study of the silkworm disease, which had so impaired the value of raw silk as seriously to threaten the industry in France. He made investigations in the plantations of southern France and was finally able to announce the results of his experiments and the means to be taken for the extermination of the plague. The history of this investigation is of great interest. It was followed by a rapid increase in the annual value of silk and the re-establishment of prosperity in the trade. Pasteur's work in preventive medicine is probably his best-known achievement. The discovery of Edward Jenner (q.v.) had never been utilized. Pasteur generalized it by determining that as each variety of fermentation is originated by a specific ferment, so in the case of various maladies the infection depended on the presence of a specific microbe. He found that «cultures,» or artificial growths, of this microbe might be obtained and that by a certain succession of such cultures the virus of the microbe became so weakened, or «attenuated,» that by treatment with them animals, though a slight attack of the given malady appeared, were rendered immune. The application of this result to cholera in fowls and anthrax in cattle and sheep was very important. Pasteur finally extended it to inoculation for rabies with beneficent effect. His discovery of the anti-toxin followed (1885) long experimentation and was highly successful. For a description of it see HYDROPHOBIA. The Pasteur Institute was soon established and similar ones arose elsewhere. Pasteur was the recipient of many distinctions, including election to the National Academy of Sciences in the United States. Among his principal works are: ‘Etudes sur le Vin’ (1866); ‘Etudes sur le Vinaigre’ (1868); ‘Etudes sur la Maladie des Vers â Soie’ (1870); ‘Etudes sur la Bière’ (1876). Consult Bournand ‘Un Bierva faiteur de l'humanitè’ (Paris 1896); Cooper, F. C.. ‘Louis Pasteur’ (a translation of Keim and Lumet's work, New York 1914); Devonshire, R. L., ‘Life of Pasteur’ (translation of Vallery-Rodot's work, London 1911); Gruber, ‘Pasteurs Lebenswerk’ (1896); Herter, C. A., ‘Les Microbes’ (1878); ‘The Influence of Pasteur on medical science,’ (Baltimore 1914); Vallery-Radot, ‘Vie de Pasteur’ (1900).

PASTEURIZATION OF MILK. See MILK.

PASTICCIO, păs-tĭch'ĭ-ō, from the Italian signifying «medley,» an inartistic device among musical composers of the 18th century, which consisted of adapting some of their earlier compositions to a new text instead of writing new music for it. It was a common practice in the 18th century to revamp old music. Just as Shakespeare and other dramatists made use of old plays, which they brought up to date. But the composers of operas and other stage music took choruses and arias of older operas and adapted them or embodied them unchanged into new musical compositions, especially operas and musical comedies. Notable examples are the chorus ‘For unto us a child is born’ from Handel's ‘Messiah,’ originally the music of a madrigal written in 1712, and Gluck's ‘Piramo e Tisbe’ adapted to the best melodies of his earlier operas.

PASTILLE, păs'tĭl or păs-tēl', a sugared confection, also an aromatic paste for burning, as a fumigator or disinfectant. It is composed of gum benzoin, sandalwood, spices, charcoal powder and other substances. See TROCHES.

PASTO, pās'tō, Colombia, province of the department of Nariño; also the capital city of the province, 100 miles southeast of Popayan, on the Rio de Pasto, a tributary of the Patia and at the southeastern foot of the volcano of Pasto, which is nearly 14,000 feet above sea-level. The city itself is about 8,500 feet above the sea-level, lies in a basin, two and a half by three miles in extent, of rare fertility and of brilliant verdure, has a college, a seminary, convents of the Franciscans, Dominicans and Augustinians and an episcopal palace, the University of Nariño; and is well built and laid out. It was founded in 1539; was twice burned during the war of independence, in which its inhabitants, mostly of Indian descent, showed rare loyalty to the Spanish crown, held Bolivar in check for some time and yielded only in 1822. The city was destroyed by earthquake in 1834. The main industries are manufactures of hats, blankets and pottery. Pop. about 30,000.

PASTON LETTERS, the collected correspondence between 1424 and 1509 of the Paston family of Paston, Norfolk. Covering the period of the Wars of the Roses and written in the frankest and homeliest way, these letters give important information as to the manners and history of the 15th century, showing particularly how undisturbed by war the greater part of the people of England were. They comprise over 1,100 letters and some state-papers in the possession of the family. There was a bitter discussion as to the authenticity of these letters, as the manuscripts could not be found after Fenn's death. But years afterward several volumes of the letters were encountered. The Paston letters were first edited by Sir John Fenn in five volumes (1787–1823); a popular edition by Ramsey appeared in 1840; but the best edition is that in the Arber reprints by Gairdner, in three volumes (1872–75) and enlarged to four volumes (1900–01).

PASTOR, a genus of birds belonging to the Starling family, found in the north of Africa, Syria and India. The name derived from the Latin pastor, shepherd, is due to their habit of congregating around sheep folds. The beautiful rose-colored pastor (*P. roseus*) is the only European specimen and being a good singer is a favorite cage-bird. It is also called the locust bird owing to its partiality for locusts as food. Its plumage is generally of a blackish-violet color, but various parts about the shoulders and abdomen are rose-colored. It has a prominent crest. In habits it much resembles the starling and it is of about the same size. Compare MINA-BIRD.

PASTOR FIDO, pās-tōr' fē'dō, Il («The Faithful Shepherd»), a pastoral drama by Giovanni Battista Guarini, played in Turin in 1585, but not printed until 1590. Composed in honor of the nuptials of a duke of Savoy, it has appeared in English in six different translations. It is the masterpiece of the author and its influence can be seen in all subsequent literature of this class. It went through 40 editions during the author's life and has been translated into almost all modern languages.

PASTORAL. See LITERARY FORMS.

PASTORAL EPISTLES. See TIMOTHY AND TITUS, EPISTLES TO.

PASTORAL LETTERS, circular epistles addressed by a diocesan bishop to those under his jurisdiction for purposes of instruction or admonition in matters of doctrine or discipline.

PASTORAL POETRY, Latin «pastoralis,» relating to a shepherd, the description in verse of country life of an imaginary kind, in which the loves of shepherds and shepherdesses play a prominent part. As the modern pastoral poetry has continued to be based on the ancient classical pastoral poetry, which itself originated in the ceremonies performed in honor of the pastoral divinities, these latter have continued to form a part of the machinery of all pastoral poetry. Nymphs, satyrs and other imaginary inhabitants of the woodlands and the streams march through pastoral poetry as though of right they belong there, as in fact they do if long prior possession counts for aught. The pastoral, much in the form in which the classical writers present it, took root in the early life of the Greek people; but the customs and beliefs out of which the early pastoral sprang must be looked for nearer the beginning of the life of the wandering tribes who came later to form the Greek nation. As the life of the Greeks became more sedentary and the tendency toward culture and civic life more pronounced, the ceremonies, songs, dances and music with which the rural deities were honored began to assume a more complex character, due no doubt to the combination of various tribal ceremonies and the further influence of adjoining tribes upon one another. Thus gradually grew up the ceremonies indicated, and as they grew they possessed a strong power over the imagination of the Greek people, learned and unlearned. It is not at all strange, therefore, that the paraphernalia of the greater and lesser divinities of nature should enter into the pastoral poems of Greece in pre-Christian days. In fact it would have been very strange had they not since they formed an integral part of the life of the nation. Ælianus ascribes the invention of pastoral poetry to Stesi-Chorus whose real name was Tesia. But the title thus applied to him would seem to indicate that he simply extended the well-known songs and pastoral poetry already in use for a long time in connection with the religious ceremonies held before the shrines of the pastoral divinities. According to the ancient grammarians pastoral poetry originated in the worship of Artemis; but this is nothing more than a personification of its origin, for Artemis was not only «the healer» and the protector of all young; but she was looked upon as the goddess of flocks and the chase; and among the immortals she was the huntress. In all these respects she is the moon goddess, the patroness of all growing things. In Arcadia, especially, she was worshipped as the goddess of the nymphs. In this latter connection her surnames and epithets are almost all derived from the mountains, rivers and lakes. There she hunted with the nymphs and she held her dances in the forest with them and the 60 daughters of Oceanus. All this undoubtedly takes pastoral poetry back to an age in the history of the race when the Greek people were as yet nomadic and their chief culture goddess was Artemis, the huntress, dancing in the forest, hunting with the bows and arrows presented to her by the music-loving Pan, or riding, swift as the wind, in her chariot drawn by four stags with golden horns. The very antiquity of pastoral poetry and the sacred character that it long maintained are the causes that made it so deep rooted, surrounded it with the wood and water spirits and connected it with shepherds and shepherdesses out of a nation of whom it sprang. So extensive was the worship of Artemis and so elaborate the ceremonies, that there came into being much pastoral poetry that has completely disappeared.

Early Pastorals.—The oldest of the pastorals that have come down to us date from the 3d century B.C. and are ascribed to Theocritus to whom are attributed 31 idyls,.in which are reproduced the language of the peasants and the life of rustics with their songs and beliefs. Some of these short descriptive lyrics are combined with short comic or dramatic parts, which show that the religious poetry of an earlier and more primitive age had already become, in a manner, divorced from its earlier associations. These poems of Theocritus are simple and, in a sense, natural if it is kept in mind that the supernatural characters that appear in them were as fully believed in as were the saints in the Middle Ages. Bion of Smyrna and Moschus followed Theocritus as pastoral poets. All of these seem to have gone to nature for their inspiration and descriptions and they succeeded in creating a school which was widely imitated throughout the Greek and Latin countries. Of the Latin writers who seized upon the Greek pastorals, the greatest was Virgil (70–19 B.C.), who idealized the scenes and ideas presented by the Greek writers and made them depend more upon imagination than upon observation. With him art stepped in and, in a sense, conventionalized the forms, instinct, for the ancient Greek, with pregnant meaning. Here was the beginning of the real pastoral poetry, which was later on to take such a hold of western Europe, for Virgil set a fashion in his «eclogue» which was followed by Horace and other Roman poets; who tended to conventionalize more and more the machinery of the early Greek religious pastorals, until they were finally worked into a condition suitable to appeal to Christian Europe.

Italy.— In the meantime there had sprung out of the old Greek and Latin pastorals rustic pastoral songs, often with much of the dramatic in them in all the countries of Western Europe. These were probably due more to the pastoral worship and its ceremonies than to the work of the Latin and Greek pastoral poets. But the two combined to form or inspire the pastoral poetry of the Renaissance. As early as the 12th century the «pastourelles» made their appearance in Provence and a century later, at least, they were popular in all the Latin and Germanic countries. Early in the 14th century the pastorals became profoundly influenced by the new learning, or the revival of the study of Virgil and other Latin writers; and from this sprang the more modern pastoral poetry. Dante, Petrarch, Boccaccio and other noted writers of the century wrote pastorals. The ‹Ameto› (1342) of the latter is the first pastoral romance written in the Italian tongue. It is partly in prose and partly in verse, the latter being used to express intensity of feeling. ‹Ameto› became very popular and set the fashion for succeeding poets. In it Boccaccio, under fictitious names, expresses his secret love for Maria, daughter of Robert, king of Naples, in graceful and forceful prose and passionate and tuneful verse; and the new and yet familiar literary style of the ‹Ameto› fitting in so well as it did, with the popular songs, and contrasting so strongly with the artificial and exotic literature of the period, appealed strongly to the Italian people then rising into nationality out of the ruin of things Roman. Dante also composed a pastoral of 12 eclogues imitated from Virgil, but containing an elaborate allegory. The work of Dante, Petrarch and Boccaccio, all of whom wrote Latin eclogues much after the manner of Virgil, marks the beginning of the pastoral movement, which, with numerous ups and downs, was to exercise a strong and lasting influence upon the literature of Western Europe into the beginning of the 19th century. Boccaccio, in his ‹Ninfale Fiesolano,› gave a dramatic turn to the pastoral; and this, with the crossed love plot and secret personal history, became popular literary machinery for subsequent Italian writers, who expanded the pastoral into drama as soon as the mediæval mystery play had begun to lose ground in the popular estimation. Baptista Spagnolus, the Mantuan, who wrote during the last quarter of the 15th and the first part of the 16th century, used the pastoral, in a semi-dramatic form, to satirize, through his rustic characters, the court, the church and the women of the day. Other writers of dramatic pastorals were busy at this time. Of these the best, and most lasting and of far-reaching influence, was Poliziano, who in 1372 put upon the stage at Mantua, a pastoral-drama opera founded on the story of Orpheus and Eurydice, and appropriately entitled ‹Orfeo.›

The happy choice of subject necessarily called for the music of Orpheus and gave a turn to the pastoral which undoubtedly had considerable to do with the subsequent development of the opera. Already little private court stages were springing up all over Italy, court pastoral drama was becoming very popular, and it was destined to exercise a powerful influence on the Italian tongue and literature, the latter of which it practically dominated in the final third of the 16th century, during which it produced some of the best poetry then written in Europe. The requirements of these court theatres, the taste of the auditors, accustomed to the court ballad, and the tendency of previous pastorals made the musical part of the performance of more and more importance and drove out of the dramatic pastoral the tragic tendencies noticeable in previous writers. Thus the pastorals were forced along the high road to opera, which finally dominated the pastoral element, originally the life of this form of dramatic literature.

In 1573 Tasso presented, at the court of Ferrara, his ‹Aminata,› a dramatic pastoral, which became at once very popular and came to be known throughout all the Latin countries, where its influence upon subsequent literature was considerable. Alvioso Pasqualigo, who followed Tasso, added the comic element to the dramatic pastoral, and Cristoforo Castelletti endowed it with the heroic and romantic; Guarini in his ‹Pastor Fido› (1590), made the dramatic pastoral still more popular and wider reaching, and Ognaro, in his ‹Aloeo› (1591) added to the pastoral literature of Italy a pastoral devoted to fishermen. Thus the pastoral continued gathering to itself all the mechanical, poetical and human elements that led along the road to modern drama and opera, and especially the latter.

Spain.— Along this road the milestones are still standing. In 1504 Jacopo Sannazaro produced his 'Arcadia,' a non-dramatic pastoral, which set the fashion for many subsequent pastorals and exercised a strong influence on every literature of the Germanic and Latin countries, whose poets sang the glorious "spirits of the wood," the artificial shepherds and shepherdesses and other rural characters, moving and acting unconcernedly in a brilliant world of supernatural beings. Sannazaro was the legitimate successor of Juan de Encina, Gil Vicente and Garcilaso de la Vega, who had introduced the Italian pastoral movement into Spain. The latter's 'El dulce lamentar de los pastores,' published in the first quarter of the 16th century, was widely read and extensively copied. Jorge de Montemayor, in his 'Diana' (1524), successfully imitated 'Arcadia,' and this Gaspar Gil Polo continued in 'Diana enamorada' (1564). This latter also exercised very considerable influence upon the direction of the highway of pastoral poetry; and Cervantes himself bears witness to the popularity of these dramatic pastorals, which influenced the creator of the sorrowful knight to write 'Galatea' (1584), a most charming and musical pastoral.

France, although rich in all the poetical elements that went to produce the pastoral drama and pastoral poetry in general, never attained any high achievement in this department of literature. There was plenty of pastoral poetry produced in France, however; but it took a different direction, which was unfortunate for its artistic development. The pastoral song, which is generally about love, is found high in popular estimation in southern France in the 13th century. In this latter form it dates back to the previous century; but it was undoubtedly of a much earlier origin. In fact, it seems to have been the survival of the old Roman May or Spring dances and ceremonies, which had been reacted upon by similar religious ceremonies of the Gaulish tribes; and out of this had sprung popular celebrations of the coming of the growing season. After the disappearance of the Latin religion these ceremonies survived under Christianity by which they were in some measure early modified. As their real religious significance began to die out, the dances lost their sacred character, and the songs sung at them became the common property of those taking part in the Spring dances. These were repeated in various modified forms and about them sprang up the pastoral songs so popular in southern France during the period mentioned. Naturally, their influence was most noticeable in Provence, because of the stronghold which the Roman religion, customs and civilization had secured there previous to the breaking up of the Roman Empire. These early pastoral songs spread over all France; but those of the North seem to have had their own independent origin much similar to that of the songs of Provence. When the influence of the Italian pastoral poetry reached France, the nation had long been going through a preparatory course, which had made her not only ready to receive it but to assimilate it; for France has ever been inclined to do things in her own way. So she proceeded to reshape the Italian pastoral and to blend it with her own "pastourelles" and her unnatural chivalric romances. The result was inferior to the pastoral poetry of Italy and Spain. Yet it had one merit. It was more or less national in form and sentiment; and it therefore probably had more influence on succeeding French literature than it might have had, had it been more like the Italian and Spanish pastorals. The French pastoral continued developing artificial qualities until it finally wore itself out by its own artificiality. The knights who went among the begemmed and lavishly-dressed nymphs were as gorgeous and unnatural as ever the imagination of chivalry produced. The greatest of the French pastorals, the 'Astrée' (1610) of Honoré d'Urfé is a culmination of the tendencies of the times. Based on the 'Aminta' of Tasso and the 'Diana' of Montemayor it received its inspiration from the same source as the 'Amadis' chivalric stories. It is written in prose, a long romance of the kind the age delighted in. Camus de Pontcarré wrote a series of pastorals from the Christian point of view and avowedly to counteract the heathen tendencies of the popular 'Astrée'; and Racon, imitating the 'Astrée,' wrote 'Les Bergeries' (a pastoral drama 1625).

England.— Real pastoral poetry in England may be said to have begun with Edmund Spenser's 'Shepherd's Calendar' (1579). Previous to this, it is true, there had been realistic shepherd scenes in the religious drama; but they were all far from the spirit of the European pastoral; and they lacked the inspiration of the Latin mythology which had failed to get in England the hold upon the people that it had upon the Continental domains of the Romans. Alexander Barclay had written a long pastoral in 1552 and 11 years later Barnabe Googe wrote another. But both were very inferior to the work of Spenser, who aimed at simplicity and naturalness. The 'Shepherd's Calendar' became popular; but it was soon overshadowed by Sir Philip Sidney's 'Arcadia' (1590). This romance, with its stately and formal characters, suited the spirit of the age and found many imitators who exaggerated its worst tendencies. About the same time three other popular pastorals made their appearance and all were inspired by the same literary vision as the 'Arcadia.' These were Robert Greene's 'Moranda,' Lyly's 'Gallathea' and Peele's 'Arraignment of Paris.' The latter two were pastoral dramas, and as such became widely known. Greene also wrote two love romances in the Italian manner, 'Never too Late' and 'Menaphon.' In 1590 Thomas Lodge published his 'Rosalynde,' a fantastic romance, that has in it more true poetic form and expression than most of the pastorals of his day. About this time John Dickenson wrote 'The Shepherd's Complaint' an eclogue and 'Risbas'; Drayton his 'Endimion and Phœbe' and 'Shepherd's Garland'; Barnfield, 'The Affectionate Shepherd' and Lyly, 'The Maid's Metamorphosis.' Long after the influence of Tasso and other pastoral poets had died a natural death, England continued to produce pastoral poetry of a lighter sort, most of which was imitation of 'The Shepherd's Calendar.' The best of these were Nicholas

Breton's 'Passionate Shepherd' (1604); Day's 'Isle of Gulls' (1606); Fletcher's 'The Faithful Shepherdess' (1610); Wither's, 'The Shepherd's Hunting' (1615); Braithwaite's 'The Poet's Willow' (1613); 'Shepherd's Tales' (1621); William Browne's 'Britannias Pastorals' (1616); Phineas Fletcher's 'Piscatory Eclogues' (1633); Thomas Goffe's 'Careless Shepherd'; Ben Jonson's 'Sad Shepherd' (1635). From this date on serious bucolic pastoral poetry may be said to have ceased to occupy the attention of literary England. The pastoral idea, however, continued to live in song in the style of Breton and Wither. Among the writers of this class are Lovelace, Stanley, Carew, Cartwright, Suckling and Herrick, the latter of whom is by far the most natural and best. He was the first of the English pastoral writers to paint truthfully the beauties of rural life. About the same time Shirley's 'Arcadia' (1640); Fanshaw's 'Pastor Fido' (1646); and Willan's 'Astræa' (1651) were converted into pastoral drama. For the next half century English pastoral poetry and especially the drama are inartistic, artificial and uninteresting. The beginning of the 18th century, however, saw a revival of the pastoral at the hands of such clever writers as Pope, Ambrose Philips, Steele and Gay. Their pastorals, however, fall short of their achievements in other literary fields. Gay's 'Shepherd's Week' was a return to the simplicity of the early pastoral verse and his influence on English literature was good. But the most influential of all the pastoral writers of the period was Allan Ramsay, whose 'Gentle Shepherd' written in Lowland Scotch, brought that forceful tongue into favorable literary notice and paved the way for the coming Scotch literature. 'The Gentle Shepherd' continued popular into the middle of last century. From this time on the pastoral, as such, was dead in England, but its influence is seen in the work of Cowper, Burns, Shelley, Landor, Thompson, Tennyson and several modern Scotch writers.

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PASTORAL STAFF, the official staff of a bishop or archbishop. The pastoral staff of an archbishop is distinguished by being surmounted by a cross, and is accordingly called a crozier. The pastoral staff is in the form of a shepherd's crook. When carried by a bishop it was held in the left hand with the crook turned outward, indicating his jurisdiction over a diocese; when assumed by an abbot, it was grasped in the right hand, with the crook turned backward, showing that his jurisdiction was limited to the members of his own house. The pastoral staff is made of ivory or wood, enriched with precious metal or jewels.

PASTORAL SYMPHONY, The, or RECOLLECTIONS OF COUNTRY LIFE, Beethoven's Sixth Symphony F major, opus 68. The musician had a passion for the country, and has composed two pastoral symphonies of which the one here mentioned (1807) is the most famous. One passage of it suggests the sound of gnats buzzing in the evening twilight, and in some phrases are represented the notes of birds, and the murmur of winds and waters; the prevailing tone is joyous. It was produced for the first time at Vienna, 22 Dec. 1808.

PASTORAL THEOLOGY, that section of theology which treats of the personal and official duties of a Christian minister in his church and parish. It covers particularly his relations with his parishioners as individuals and also those with the public at large as representing his church. In the Roman Catholic Church and the Church of England these duties devolve upon the curate.

PASTORALE, *in music,* a composition of an idyllic character; also a composition for a dance, generally in six-eight or twelve-eight time.

PASTORELS, a variant form of Pastoureaux (q.v.).

PASTORIUS, Francis Daniel, American colonist: b. Sommerhausen, Germany, 1651; d. 1719. He visited England and there became a member of the Society of Friends and made the acquaintance of William Penn, to whose colony of Pennsylvania Pastorius, in 1683, emigrated at the head of a company of Mennonites from Germany and Holland, and settled at Germantown, now a part of Philadelphia. Piety and learning were united in Pastorius to practical energies and qualities of leadership, whereby the influence of his character was made deep and lasting among his followers. Within five years of his coming to America he signed a protest to the Friends' yearly meeting in Burlington N. J., which declared slavery to be unchristian, and which, as the first formal anti-slavery declaration made in this country, was celebrated by Whittier in his 'Pennsylvania Pilgrim.' To the Germantown book of records Pastorius prefixed a Latin ode addressed to posterity, which was translated by Whittier. Pastorius also wrote a 'Geographical Description of Pennsylvania' (1700), which was originally published with a German title.

PASTOUREAUX, päs-too-rō', bands of French peasants who attempted in the 13th and 14th centuries to better their pitiful conditions by appeal to arms. There were three of these risings. The first, in Berry in 1214, was aimed against both the feudal lords and the monasteries, but was quickly and severely repressed; the second, in Flanders, in 1250 under the lead of the "Master of Hungary," pretended to be a crusade to recover the Holy Sepulchre. Its members assumed priestly functions and denounced the wickedness of the clergy. Nothing could be done to check its excesses until the body numbering 60,000 or 100,000 men divided after leaving Paris into several companies, which were speedily attacked and slaughtered by the king's forces. The third rising of the Pastoureaux in 1320 was again composed of illuminés and again under cover of a pretended crusade; it laid waste Berry, Saintonge, Aquitaine and Languedoc, and killed 500 Jews at Verdun-sur-Garonne. Near Aiguesmortes they were hemmed in; many died of starvation and others were hanged and imprisoned.

PASTURE, grass-covered land upon which domestic animals are placed to graze. In its broad application the term includes the unenclosed grazing areas of the western ranges, the Argentine pampas and the Russian steppes. In a narrower and more popular way it refers to the enclosed fields similarly used upon farms. Small enclosed pastures close to farm buildings are frequently called paddocks. Since many things, especially drought, may occur to impair the productivity of pastures, it is customary to grow fodder crops, especially corn, in proximity to the pasture, and to cut this crop as occasion may require. This serves the double purpose of supplying the animals with needed food and preventing the injurious, close grazing of the pasture. An essential adjunct of pastures is an adequate supply of pure water available at all times to the animals; and a highly desirable feature is shade, best furnished by trees located at the highest points, the margins and on the poorest soil of the field.

Pastures differ from meadows in the character and habits of the plants which grow upon them. Whereas meadow grasses and other plants are usually tall-growing and ready to cut all at one time, the herbage of pastures is generally low-growing, and the various species reach maturity at various times throughout the season. The former are often «stooling» or «tillering» grasses, the latter creeping and mat-forming. The selection of species is largely dependent upon the climatic and soil conditions and also upon the length of time the pasture is to remain. For temporary pastures short-lived grasses are often used, but for the permanent pastures the perennials and turf-forming species should be chosen. Timothy (*Phleum pratense*), the leading meadow and hay grass in the eastern United States, is sometimes seeded for pasture but its stooling habit, its inability to form a good turf and its liability to injury by the trampling of the animals, are decidedly against its use in pastures. For the Southern States, Texas blue grass, Bermuda grass, carpet grass, large water-grass are probably in most general use, the first two particularly. On light, sandy soils creeping bent-grass, Kentucky blue grass, red fescue and white clover are in popular use. On wet soils perennial rye-grass, redtop, or creeping bent-grass, and alsike clover are in general use. In regions where the rainfall is adequate and upon ordinary soils the following are general favorites: Kentucky blue grass, tall fescue, Canada blue grass, redtop, perennial rye-grass, orchard-grass and white clover. Red clover and alsike are also planted to some extent, but they are rather tall growing for pasture plants. The botanical names and characteristics of these plants are described under GRASSES OF THE UNITED STATES.

In general, the best pastures are formed upon well-drained, but moist, loamy soils, varying in quality from clay to rather sandy loam, but not usually including what are termed sandy and gravelly soils. As a prime necessity they must be rich in all plant foods, especially nitrogenous and organic material. The former is essential to the luxuriant growth of herbage, the latter to improve the physical qualities of the soil, particularly texture and water-retaining capacity. To supply these elements, barnyard manure is most frequently employed and, when properly cared for and applied, is best. It is insufficient, however, even with the droppings of the animals, to keep the land in its best producing condition. Hence, commercial fertilizers must be applied liberally; phosphoric acid and potash at any season and nitrate of soda and other quickly soluble fertilizers in the spring or during the summer. These remarks apply to the annual management as well as to first preparation. The land should be deeply plowed, thoroughly harrowed to make the surface as fine as possible, the seed sown on a windless day — if possible just before a rain. Since little weeding can be done, it is highly desirable to purchase as clean seed as possible, the high price for «recleaned» seed being more than repaid in the quality of the crop. Often for permanent pastures short-lived grasses may be mixed with the perennial sorts in order to choke weed-growth. The perennials do not suffer but soon gain possession of the ground. When the plants are growing well the field should be mowed close to the ground in order to destroy the taller weeds and prevent their production of seed; and this should be repeated several times each year until the grass has full possession. This labor may be lessened in many cases by turning sheep upon the pastures previously occupied by cattle or horses because the sheep eat many weeds that the other animals ignore. Harrowing pastures in early spring is considered advantageous, since it admits light, heat and air and reduces the struggle among the plants. Reseeding pastures is generally not advisable, plowing and planting to other crops for several years being preferable.

It is generally found advisable to pasture the various domestic animals separately, since cattle and horses may annoy or even injure one another, and since sheep crop the grass so closely that they deprive the larger animals of their share. Dairy and beef cattle are generally pastured separately because of the differences in their general management. Great care must be exercised to pasture no more animals upon a given area than can be easily fed from it. When too many are present the animals not only kill out the grass but encourage the growth of the weeds they will not eat. (See LAWN; MEADOW). Consult Spillman, J. W., 'Farm Grasses of the United States' (New York 1909); Sutton, M. J., 'Permanent and Temporary Pastures' (London 1911).

PATAGONIA, păt-ą-gō'nĭ-ą, South America, a name formerly used of all the southern part of the continent, but now used of the region bounded on the north by the Rio Limay and the Rio Negro, the Atlantic on the east, the Strait of Magellan on the south and the Andes on the west. The region, discovered by Magellan in 1520, was practically unexplored (save by Darwin in 1839) until 1869. Since then, however, it has been explored by Musters, Moreno, Moyano, Fontana, various officers of the Argentine army and scientists, and in 1896–99 by a Princeton University expedition, led by J. B. Hatcher. The country is a tertiary plateau with terrace-like drops to the sea-level at the coast, so that the etymology of the name seems to be from Quichua *patacuna*, «terraces.» There are many volcanic rocks, especially basalt; a few volcanoes even in the Andes, Fitzroy being the most important; and many large salt lakes. The climate is cold, the region lying between the isotherms of 14° and 7° C. At Rawson the temperature has a maximum of 31° C. in January and a minimum of —7° C. in June. The climate and temperature closely resemble those of South Africa. The flora is scanty in the extreme south and everywhere differs very remarkably from that of the surrounding country. Along the river courses there are willows; peculiar vegetation marks the salt lagoons, and in the tertiary plateau the plants resemble those of the Mendoza, and there are many cactuses. The fauna also is scanty. The birds are of particular importance as showing many unusual instances of specialization. Families which everywhere else live in trees have here lost their arboreal habit and nest on the ground. There are wild horses and cattle. The "Patagonian giant" has been greatly exaggerated; Mr. Hatcher gives the average height of the men as 5 feet 11 inches, weight 175 pounds, and of the women, height, five feet seven inches and weight about that of the men. They were nomads. The Roca expedition of 1880 almost wiped them out. The entire region was long unclaimed. Later it was disputed between Argentina and Chile, and was finally divided between these two powers, the Cordillera being the boundary by the convention of 23 July 1881. The portion belonging to Chile is now known as Magallanes, while Argentine Patagonia consists of three political divisions: Rio Negro, Chubut and Santa Cruz; so that Patagonia has now no separate political existence. Consult Campbell, 'Through Patagonia' (1901); Musters, 'At Home with the Patagonians' (1871); Prichard, 'Through the Heart of Patagonia' (1902); and 'Reports of the Princeton University Expeditions to Patagonia, 1896–1899.'

PATALA, pä-tä'lą, the Hindu lower regions, described in the Puranas as seven in number, each being more than 3,000 leagues in depth though some authorities say there are eight Patalas. They are inhabited by demi-gods of various kinds and orders, who live luxuriously in splendid mansions, feasting on choice viands and fruits, and quaffing delicious wines. They wander at will amid glorious forests along streams and by the side of lakes whose banks are covered with flowers, while the lotus floats upon the bosom of their waters. The Patalas should not be confounded with the Narakas, or infernal regions, with which they seem to be in no way related. They are the home, among other supernatural beings, of the Nagas or mythological serpents.

PATAMAR, a native sailing vessel common along the coasts of India. It is about 75 feet long, 20 feet broad and 12 feet deep, with a burden of about 200 tons. It has two masts, with lateen sails. Smaller ones have but a single mast. They have a prow stem the same length as the keel. It is fast, and on this account was formerly much used in the carrying of dispatches; but in this business it has been replaced by steam launches.

PATAN, pą- or pŭ-tän', variant spelling of Pattan (q.v.).

PATAÑJALI, pą-tŭn'ją-lĭ, Sanskrit grammarian, who wrote about 140 B.C. (or possibly as late as 25 A.D.), a commentary called Mahâbhâshya, or 'Great Commentary,' on the previous work of Pânini (q.v.), and especially on the criticism of Pânini by Kâtyâyana; this work, edited by Kielhorn 1878–85, is one of the most important sources of our knowledge of Sanskrit grammar. Patañjali, whether the Grammarian or another, is the reputed founder of the Yoga system of philosophy, which proclaimed that salvation and bliss were to be attained by the union of the individual soul with the great soul, Içvara, and that this can be attained by austere life and meditation. He is generally credited with being the author of the Mahâbhâlate; but it is quite possible that there were two writers of the same name. If so, this would explain the uncertainty as to even the century in which the grammarian lived.

PATAPSCO, pą-tăp'skō, a river of Maryland, flowing into Chesapeake Bay, 14 miles south of the city of Baltimore. It enters the bay by a large estuary, which forms the harbor of Baltimore, and is navigable for the largest vessels. Along its banks are numerous waterpower stations which supply power to the city of Baltimore and to various industries outside the city itself. See BALTIMORE.

PATAS MONKEY, a reddish guenon (*Cercopithecus patas* or *Erythrocebus patas*) of western equatorial Africa. It is notable for its reddish color and its grayish checks and under parts.

PATCH, Edith Marion, entomologist: b. Worcester, Mass., 27 July 1876. Educated at universities of Minnesota, Maine and Cornell where she specialized in entomology. She organized the department of entomology of the Maine Agricultural Station of which she has since (1903) been entomologist. Her work there, which has been conducted along experimental lines of a highly educational nature, has made her name well known throughout the United States and Canada. Her research deals largely with problems relating to ecology and economic entomology. She has written much for magazines and has published several stories quite different from her serious technical and official work. Among these are 'Dame Bug and her Babies' (1913); 'How Laddie Tells the Time O' Year' (1914).

PATCH, Kate Whiting, American writer: b. Elizabeth, N. J., 22 Aug. 1870; d. 1909. She was married in 1893 to F. W. Patch, a physician of Framingham, Mass., and is the author of 'Middleway' (1897); and the juvenile books, 'Rainy Days and Sunny Days' (1899); 'Old Lady and Young Laddie' (1900); 'Prince Yellowtop' (1903).

PATCH, Samuel, American athlete: b. Rhode Island, 1807; d. Rochester, N. Y., 13 Nov. 1829. He went to sea when very young, and later became a cotton-spinner at Paterson, N. J. He made a reputation for feats in diving, the leap which he took from the bridge spanning the Passaic, a distance of 80 or 90 feet, into the pool below the falls, attracting widespread attention, and he thereafter traveled over the country, diving from topmasts and bowsprits of vessels. At Niagara Falls he made a leap of more than half the height of the falls, but dissatisfied with this performance he advertised a leap of 125 feet at the Genesee Falls, in which he lost his life.

PATCHES, are small pieces of silk or court-plaster used on the face to apparently heighten the complexion by contrast. During the 17th and beginning of the 18th century these fantastic ornaments were commonly worn by women and sometimes by men. In the United

States the practice was revived in the 20th century by fashionable people in some circles of society.

PATCHOGUE, păt-chŏg′, N. Y., village Suffolk County, on the southern coast of Long Island, on Great South Bay, and on the Long Island Railroad, 51 miles east of New York. It was incorporated as a village in 1893. Its most important industries are oystering and fishing; it has good dock facilities, and is one of the chief harbors for the fish and oyster boats of the bay. It has also a cold storage plant, and a number of manufactures, including lace, paper, lumber and surveyors' supplies. It is a favorite place of residence, one of the popular summer resorts of Long Island and contains several hotels. It has fine residences, handsome churches, a high school and a public library. The governing body is a board of trustees, and the executive a village president, who holds office for a year. Pop. about 5,000.

PATCHOULI, păt-choo′lĭ, known in India as «puchapat,» a perfume obtained from the dried leaves and branches of the *Pagostemon patchouli*, a mint of India and China, where it is cultivated on a large scale; the plant has also been acclimatized in France. The branches and young leaves are highly odoriferous, like sandal-wood, but the perfume is much more intense. The essence obtained from them by distillation is a kind of heavy dark-brown oil, which nullifies the effect of an equal weight of any other vegetable perfume which may be mixed with it. It is used in India to scent the costly Cashmere shawls, with the view of keeping out moths. Hence real Cashmere shawls were known by their scent, until the French, who had succeeded in imitating the fabric, found out this secret also, and imported the plant for a like use. In Asia it is also used for scenting ink-cakes, tobacco and hair-oil, and is everywhere valued as a preservative of woolens and linens from insects. The pure essence, having a disagreeably powerful odor, requires to be greatly diluted for the purposes of the perfumer.

PATE DE FOIE GRAS, pā-tā′ dē fwā grä (paste of fat liver), «Strassburg pie,» a French article of food, made from the livers of geese, and much relished by epicures. It is a sort of potted meat considered a great delicacy, which is made in different parts of France, but chiefly in Strassburg and Toulouse. Fowls are fed and stuffed artificially with salted grain, chiefly Indian corn, which makes their livers grow abnormally large. These livers, prepared in a special way and covered with melted goose fat to keep them protected from the air, are usually packed in earthen pots, though of late the cheaper grades, especially the imitations made outside of France, are sometimes put up in tin cans.

PATELLA, the kneecap or kneepan, an irregularly oval bone covering the knee-joint, developed in the tendon of the large muscle of the thigh, which is made up of the rectus femoris, vastus internus and externus, vastus internus and the quadriceps extensor cruris. This muscle becomes narrowed down at its lower end, and forms the ligamentum patellæ, which is attached to the front surface of the tibia, and is one of the important muscles in extending the leg. It has developed at its lower end the sesamoid bone, the patella, over which it slides. It is a flattened bone of triangular cross-section, thickest in a vertical line in the centre. Its front surface is rounded and is attached to the tendon of the muscles; its back surface is covered with cartilage and forms an important part of the knee-joint, articulating with the femur at different places as this bone is moved. In front of the patella, separating it from the skin, is a bursa. Affections of the patella are not rare. Inflammation of the bursa is common in those who are compelled to be on their knees continuously. A chronic condition known as «housemaid's knee» results from this, and is often extremely difficult to treat. An equally common condition is a mild inflammation of the synovial mucous membrane behind the patella. This is a condition sometimes set up by violent athletics, excessive exertion as in tennis, football, skating, bicycling, etc. It usually follows some injury of the knee, and may result in partial stiffening of the joint. Rest, hot applications, and a plaster bandage are the best preventives of this condition. Following gross accidents, dislocation or fracture of the patella may occur. Dislocation is a rare accident, and usually is the result of direct violence. The patella may be dislocated either toward the inward or the outward side of the leg; most frequently the dislocation is outward. The sudden limitation of motion, together with the appearance of deformity, renders the diagnosis simple. Reposition is also easy. Fracture may result from direct violence, or it may result from sudden forcible stiffening of the great muscles of the thigh. Such a fracture is usually transverse, one portion of the bone remaining fastened by the stiff ligament, the upper portion usually being pulled some distance — half an inch to two inches — away by the thigh-muscles. Treatment of this accident may be by rest and by bringing the parts together after absolute muscular relaxation, further keeping them in position by a plaster of paris bandage; or it may consist of the surgical procedure of wiring. In this operation an incision is made and the two fragments are drawn together and firmly fastened in position by means of silver wire. Plaster bandages are worn for several months, as in the conservative operation, and the results will vary greatly, according to results of the inflammatory processes, and the personal equation of the patient's own bone-vitality. The results in most instances are fairly satisfactory. A stiff knee may follow;. a weakened knee is always to be expected.

PATELLAR REFLEX. See KNEE JERK.

PATEN (Latin, *patina,* a plate or dish), in ecclesiology, the plate or salver on which is placed the element of bread in the eucharistic service. In ancient times it was often made of wood or glass; but as the Church became more wealthy, patens were made of gold or silver, some richly ornamented with gems and enamels.

PATENT MEDICINES. This term is quite usually, but erroneously, applied to that class of medicinal preparations which are put up in uniform packages and which are offered for sale under distinctive trade marked or copyrighted names. These remedies, which are made in liquid, solid or semi-solid form, are articles of almost universal household use throughout the United States, and are very frequently prescribed, either separately or in combination, by physicians. Patent medicines are usually combinations of well-known drugs. They are not (with very few exceptions) patented, but are more correctly designated as «Proprietary medicines» (because those who manufacture them have proprietary rights in formulæ, trade names, etc.) or «package medicines.» The term «patent medicine» originated from royal patents, or marks of favor, granted by early English kings to the originators of meritorious medicinal compounds, and the name, as well as many examples of the products, were brought to America by early immigrants. Many widely used and generally known medicinal products were originally patent medicines, among which class might be cited Dover's powders, paregoric, etc. Usually (but not always) these so-called patent medicines are sold as complete preparations, the formulæ from which they are manufactured being the exclusive property of the manufacturer. In a majority of cases they originated with practising physicians whose favorite prescriptions they were and some of them have been on the market over 100 years; many over 50 years and a much larger number over 25 years. Many preparations which originated as so-called «patent medicines» have been admitted to the United States Pharmacopœia, the pharmacopœias of other countries, the National Formulary and other similar works, and many meritorious and useful drugs have first been introduced to *materia medica* through their use in patent medicines. Many instances of such introductions might be cited. Among these are quinine, echinacea and cascara. Many well-known patent medicines have been introduced to the public by the prescriptions of practising physicians. The place of «patent medicines» in domestic economy is so well established that, during the World War when American industry was, by government restrictions, put on a «win the war» footing, the patent medicine industry was included among those industries, considered essential to public welfare, placed on the government priorities list and allowed its full requirements of such necessities as sugar, alcohol, glycerine, coal, etc., which were denied (or allowed in reduced amounts), to many other industries. The American manufacture of package medicines dates back about a century and a half. Latest available United States Census Bureau statistics (for the commercial census of 1914) show 2,271 establishments chiefly engaged in the manufacture of patent and proprietary medicines and compounds. The value of the output (at manufacturers' prices) was approximately $83,000,000 for 1914. It shows a steady growth from the time of first government statistics on the subject. Approximately 25,000 people were employed in 1914; the invested capital was about $80,000,000. In addition to the 2,271 establishments engaged chiefly in the manufacture of patent medicines, there is a large, but undetermined, number of others with whom the manufacture of patent medicines is not the chief part of business. Many retail druggists manufacture one or more medicines which are sold under trade or proprietary names. No attempt has been made to secure data of this class of manufacture, but in the aggregate the number of preparations, and the total output reckoned in terms of dollars is a very large sum.

The manufacture of patent medicines is carried on to some extent in practically every State in the Union, except Arizona, Idaho, Nevada, New Mexico and Wyoming. New York leads with 806 establishments, Illinois is second with 363, Pennsylvania third with 324, Ohio fourth with 252, Missouri fifth with 212, Massachusetts sixth with 162, Indiana seventh with 156, Michigan eighth with 142, etc. The patent medicine industry is known for the extent and mechanical and sanitary completeness of many of its laboratories. Manufacturing is frequently done on a large scale, with modern machinery and appliances for testing and proving materials and products. In some instances the crude drugs used in the manufacture are grown for the manufacturers, in others they are gathered under the supervision of representatives of the manufacturers, and in a greatly larger number they are obtained from drug importers or millers, and every process of manufacture is carried on in the manufacturer's laboratory. In other cases partially prepared ingredients are purchased and combined, and in still others the actual manufacturing is done by manufacturing chemists (several of whom have large and completely equipped plants for that purpose), while only the bottling or packing is done in the establishment of the proprietor. Distribution of the product is usually through the wholesale drug houses and retail drug stores and 52 per cent of the gross business of wholesale drug houses is in this class of merchandise.

PATENT OFFICE, United States. See PATENTS, THE LAWS OF.

PATENTS, The Laws of. The extraordinary industrial and commercial development of the United States during the 19th century was due primarily to three causes: Physical, social, legislative. The extraordinary natural wealth of the country was not fully appreciated even 25 years ago. Its vast agricultural possibilities were disclosed earlier in the century with the opening up and development of the great West. Its abundance of forest lands, of course, were recognized, but not its great mineral resources, its great deposits of copper, its high grade iron ores, and the full meaning of the contiguity of these iron ores to vast coal fields bearing the richest deposits. These physical resources, however, might not have yielded to such rapid growth were it not that a race of men was at hand singularly adapted to carrying forward the work of the country's development. The aggressiveness, courage, energy and brains necessary for the work were the result in part, perhaps, of the assimilation of strong men of different nationalities, and partly, perhaps, to the energy derived from climatic conditions. The vast industrial development, however, which has gone forward with leaps and bounds in all sections of the country, would have been impossible had it not been for the wise laws which more than anything else have served as a stimulus to such development. It has been estimated that seven-eighths of our industrial enterprises are dependent directly or indirectly upon our patent system, or that such enterprises owed their being originally to our patent laws. The beneficence of our patent system is now pretty generally recognized, but this attitude is of comparatively modern growth. The prejudice which existed against patents as monopolies during the 18th century and the early part of the 19th century was a perfectly natural one.

Patent History.— The granting of patents to individuals or guilds was of very early origin and reached its greatest abuse in England during the reigns of Elizabeth and James, when the granting of exclusive monopolies under letters patent to individuals or corporations for the manufacture or sale of certain classes of commodities or luxuries was an easy although scandalous method of filling the royal exchequer. The early monopolies were of two kinds, legal and illegal. To the first class belong such as are conferred on the inventors of a new manufacture or the introducer of new trade, and to the second class belong the exclusive grants to individuals or corporations to manufacture and sell commodities or necessities of life, such as salt, tobacco, etc., thereby restricting trade and preventing those who had established such industries from obtaining a livelihood therefrom. The famous Statute against Monopolies, 1623, put an end, however, to these abuses, but the word «patent» carried unfortunately the taint of its early abuse, and for a century or more patents were looked upon askance. The law of patents in its modern significance, however, did not begin to be understood until the 19th century had dawned. In the United States the law of patents rests not upon common law, but upon statutory provision. In early colonial days patents were issued by the Colonial governments. The earliest patent issued in this country appears to have been granted by the General Court of Massachusetts Bay Colony, in October 1641, to one Samuel Winslow for a process of manufacturing salt. The term of the patent was for 10 years and the grant was conditional upon works being established within the year. In 1656 Massachusetts Bay Colony granted a patent to John Winthrop, son of Governor Winthrop, with the «sole privilege of manufacturing salt after his particular method» for a term of 20 years. Massachusetts, Connecticut and Pennsylvania were the principal members of the 13 original colonies which granted patents. The Articles of Confederation, adopted 12 July 1776, contained no provision for the granting of patents, but the States issued patents independently as the colonies aforesaid had previously done. In 1785 James Rumsey obtained patents from the States of Maryland, Virginia, Pennsylvania and New York, for a new type of boat which during the previous year had had a trial on the Potomac River in the presence of George Washington.

The authority granted to Congress for the enactment of legislation affecting patents is derived from that article of the Constitution which empowers Congress to make laws which will promote the progress of the useful arts.

The first patent laws of the United States were enacted in 1790, and the person who had the honor of receiving the first patent issued by the United States was Samuel Hopkins of Vermont. The patent bore date of 31 July 1790, and was for a process of making pot and pearl ashes. If this early parchment is still in existence, the owner is a fortunate man, for the document is certainly a historical curio. It possesses a special interest as it bears the signatures of George Washington, as President, Thomas Jefferson, Secretary of State, and Edmund Randolph, Attorney-General. All the early patents bore the signatures of the Presidents of the United States, were usually embossed on vellum in folio size and bore the great seal of the United States. Three patents were issued in 1790 and 55 in all under the act.

The attitude of the public and of the courts up to this time was antagonistic to patents as a rule. The old prejudice against monopolies still lingered in the minds of men, and the vast advantages to be gained by liberal laws as a stimulus to invention were not yet understood. If a question of right under a patent were brought up for trial, the presumption was generally against the claims of the inventor. As time passed, however, and a broader and more intelligent spirit prevailed, more favorable laws were enacted and a more generous interpretation of old laws crept in. Under the earlier dispensation the inventor was obliged to meet the enormous outlay that the securing of a patent demanded, or he kept his invention secret. The latter method has resulted in so many cases in what are known as lost arts.

The patent statutes received the serious attention of Congress in the late 30's and a number of acts were enacted, which placed the patent system on a substantial basis. The interest taken in the patent laws and the public demand for an extension of the system are evinced by the fact that new statutes were enacted in the years 1836, 1837, 1839 and 1842.

The present patent laws of the United States are those of 1870, at which time the preceding acts and parts of acts, numbering over 20, were consolidated and revised, and the former period of 14 years allowed to a patent was extended to 17 years. Revisions have been made from time to time, and the patent law as revised is issued in pamphlet form by the government for distribution to those interested.

What is a Patent?— The term *patent* or *letters patent* is derived from *litteræ patentes,* signifying that which is open or disclosed in contradiction to *lettre de caché,* that which is sealed or secret. Primarily the patent is to *make known* to the people the new invention and its uses and advantages; secondarily it confers upon the patentee for a stated period a monopoly of the manufacture, use and sale of the patented article. This term is the keynote of the whole principle upon which the patent system is built up, namely, disclosure. The disclosure must be honest, absolute and unreserved. The penalty for mental crookedness or for ignorance in giving out fully and freely the nature of the invention is severe and direct and is nothing less than forfeiture of the patent itself. The reason for this is perfectly logical and arises from the very meaning, spirit and nature of the relationship existing between the patentee and the government. The term of a patent is 17 years. The patent itself, however, is in the nature of a contract between the patentee and the government, presumably for their mutual benefit. The government grants to the inventor the exclusive right of manufacture and sale for 17 years on condition that the inventor shall disclose fully the nature of his invention or discovery, and shall allow the public the unrestricted use of the invention after this term has expired. If he fail in making full disclosure, he has not lived up to the terms of his implied contract and the contract thereby becomes null and void. It sometimes happens that an inventor discloses freely part of the invention, but cunningly conceals some essential step in the process, but if the case is tested within the courts and the real facts are brought to light, the patent will be declared invalid. An interesting instance in point is one which came to view in connection with the entry of the United States as a belligerent into the Great War. The United States followed the procedure of Great Britain and France as to German and Austrian patents, issuing licenses to American manufacturers through the Federal Trade Commission to work the patents in this country. When this was attempted it was found that in very many cases one of the essential steps in the processes patented had been omitted in order to preserve secrecy. This being a direct violation of the United States Patent Law, the incomplete patents were declared void. American manufacturers who discovered the missing links in the faulty descriptions were allowed to make application for patents under the complete descriptions, with the ultimate result that the original holders of the German patents are estopped from marketing in the United States the products thus patented without paying a royalty to the American holders of the complete patents. At the end of the term of 17 years the patent becomes public property, and the article may be freely manufactured by any one. It can never thereafter, as in so many cases in the Middle Ages, become a lost art.

Who May Obtain a Patent?— In order to secure a valid patent, the applicant must declare upon oath that he believes himself to be the true, original and first inventor or discoverer of the art, machine, manufacture, composition or improvement for which he solicits a patent; that he does not know and does not believe that the same was ever before known or used; and that the invention has not been in public use or on sale in the United States for more than two years before the application was filed, and that the invention has not been described in any printed publication for longer than two years prior to the filing of the application. Any one who can subscribe to the above conditions may apply for a patent, irrespective of race, color, age, or nationality. Minors and women and even convicts may apply for patents under our law. But it is provided that a lapse of a year between the filing of the application and its completion forfeits the patent — except in such cases as the commissioner may permit a longer time. The rights in an invention are not lost by death, for an application may be filed by the executor or administrator, and the rights of heirs thereby safeguarded. The patent in this case would issue to the executor or administrator and would become subject to the administration of the estate like any other property left by the deceased. Even the rights of an insane person may not be lost, as the application may be filed by his legal guardian. If foreign patents for the same invention have been previously issued, having been filed more than 12 months before the filing of the United States application, the patent would be refused. During the war a moratorium of nine months was allowed by Congress beyond the 12 months prescribed in the law. The applicant must state his nationality. It often happens that two or more individuals have jointly worked upon the invention, and in this case the several inventors should jointly apply for the patent. Should they not so apply the patent when issued would be invalid. If they are merely partners, however, and not coinventors, they should not apply jointly for a patent, as the inventor alone is entitled to file the application. He may, however, assign a share in the patent to his partner, coupled with the request that the patent should issue to them jointly. It is of the greatest importance that these distinctions should be clearly understood; otherwise, the patent may be rendered invalid. Joint patentees may each exercise independently all rights conveyed by the patent without making any accounting to the other owners. Each may make, use and sell the invention on his own account and may issue licenses to others for his own personal benefit.

What May be Patented?— Any *new and useful* art, machine, manufacture or composition of matter, or any new and useful improvements upon an old, or already patented article. The patent for an improvement does not affect the earlier patent. A patent may also be allowed on a new combination of old appliances, upon new designs and upon new compounds for useful purposes. The thing invented must be *new and useful*. These are conditions precedent to the granting of a patent. Of these two conditions by far the more important is the former, and it is concerning the interpretation of this word "new" and its bearing upon the invention that the principal work and labor involved in passing an application safely through the Patent Office is involved. When the invention has been worked out by the inventor and he is prepared to file his application, his attorney prepares the necessary papers, as provided for by law, namely: An oath, a petition, a specification consisting of a description of the invention and concluding with claims which specifically set forth what the inventor claims to be the novel features of the invention, and drawings which are prepared and filed with the case, and in due course the application is ready for examination in the Patent Office. The question of whether the invention is *new* is then considered, and the burden of proof that the invention is not new rests upon the Patent Office. The examination consists in searching through the files of the Patent Office among the patents that have been already issued, and through such literature as may bear upon the subject. If any reference is discovered that anticipates the invention, as defined by the claims of the specification, the applicant is informed of the fact, and he is allowed to amend his papers and narrow the claims so as to avoid the prior patents, if possible. But no new material may be introduced in such amendment. If his attorney considers the position of the Patent Office untenable, he may present arguments to show wherein he believes that the inventor is entitled to a patent. It is thus seen that the question of whether an invention is new is one of fact, and one of the greatest importance, and upon the showing that the inventor is able to make during the prosecution of the case depends largely the future success of the patent. The evidence adduced in proving that the invention is not new must be tangible and accessible. A patent would not be refused or overturned on a mere mental concept. There must be some evidence of a substantial character that serves to show that the earlier idea was reduced to practice or at least that there was such a description or drawing made, as would be sufficient for one skilled in the art to reduce the invention to practice. If it has not been actually reduced to practice, it must be a concrete not an abstract idea.

It is essential that the application for a patent should be filed before the invention has been in public use or on sale for a period of two years. If the inventor has publicly used or sold his invention for a period of two years, it becomes public property and he cannot regain the right to obtain a patent. He may, however, make models and experiment with his invention for a much longer period, provided he does not disclose his invention to the public or put it into actual use or on sale for a period of two years. The word «useful» is not one which usually gives either the Patent Office or the inventor a great deal of trouble, as any degree of utility, however insignificant, will serve to entitle the inventor to a patent. It has often happened that an invention which appears, at the time the patent is applied for, to have no special utility, in later years owing to new discoveries or improvements in the arts is found to possess the greatest merit and value. Unless an invention is positively meretricious, therefore, it is difficult to assume that it either has no utility or never will have any. Patents are granted for «any new and useful art, machine, manufacture or composition of matter, or any improvement thereon.» It is seen from the terms of the statute that almost any creature of the inventive faculty of man becomes a proper subject for a patent. The exceptions are very few. Patents will not be granted, for example, for any invention that offends the law of nature. Under this category may be mentioned perpetual motion machines. In case an application of this character is presented, the commissioner politely informs the applicant that the matter cannot be considered until a working model demonstrating the principle of the invention has been deposited in the Patent Office. Inventions of an immoral nature will not be considered. Medicines and specifics are not now proper subjects for letters patent, unless some important new discovery is involved. Under a recent ruling of the Patent Office hundreds of patents were suspended lest they might prove to be an aid to the enemy in prosecuting the war, or a menace to public safety.

Patented Articles Must be Marked.— Articles manufactured and sold under a patent must be so marked that the public shall have notice that the article is a patented one. This notice consists of the word «Patented,» together with the day and year when the patent was issued or the serial number of the patent. Damages in an infringement suit cannot be recovered unless the defendant has such notice on the article itself that it is patented. The term of a United States patent is 17 years. This term cannot be extended except by special act of Congress. It is many years since a bill seeking an extension of the term of a patent has been passed by Congress.

Appeals.— If an application for a patent has been rejected, the applicant may appeal from the primary examiner to the board of examiners-in-chief. He may further carry the appeal to the Commissioner of Patents, and in case he is not satisfied with the latter decision, he may carry the appeal finally to the Court of Appeals of the District of Columbia.

Interference.— If two or more individuals shall have invented the same thing at or about the same time, interference proceedings may be instituted to determine which applicant is the original or first inventor. Interference proceedings are instituted between applicants whose applications are pending or between a pending application and a patent already issued, provided the latter patent has not been issued for more than two years prior to the filing of the conflicting application. The proceedings are conducted before an examiner of interferences. Appeal may be taken from the examiner of interferences to the board of examiners-in-chief, and from the board of examiners-in-chief to the Commissioner, and thence to the Court of Appeals of the District of Columbia. Not all the claims for a patent are necessarily involved, only such as cover the particular feature of the invention which is declared to be in interference. The unsuccessful applicant by eliminating the claims or claim in controversy may procure allowance of the other claims not objected to, and have the patent issued. In determining the question of priority of invention, witnesses are examined and the proceedings are conducted much in the same manner as in a suit at law. The first step in the proceeding consists in filing with the Commissioner a preliminary statement made under oath, giving the date at which the invention was first conceived and reduced to some tangible form, such as the making of drawings, the construction of a model or the disclosing of the invention to another. The object of the subsequent examination and cross-examination is to substantiate the date of invention as claimed by the applicants respectively, and to establish the priority of invention.

Infringement.— In case of an action for the infringement of a patent, the importance of the question of novelty appears from the special pleadings which the defendant may enter, which are as follows:

1. That for the purpose of deceiving the public the description and specification filed by the patentee in the Patent Office was made to contain less than the whole truth relative to his invention or discovery, or more than is necessary to produce the desired effect; or,

2. That he had surreptitiously or unjustly obtained the patent for that which was in fact invented by another, who was using reasonable diligence in adapting and perfecting the same; or,

3. That it had been patented or described in some printed publication prior to his supposed invention or discovery thereof; or,

4. That he was not the original and first inventor or discoverer of any material and substantial part of the thing patented; or,

5. That it has been in public use or on sale in this country for more than two years before his application for a patent, or had been abandoned to the public.

Damages for infringement of a patent may be recovered by action on the case in the name of the patentee or his assignee. The courts having jurisdiction over such cases have the power — (1) To grant injunctions against the violation of any rights secured by the patent; (2) to allow the recovery of damages sustained by the complainant through such infringement. In such a case the defendant is compelled to furnish an accounting showing the amount of the articles manufactured and sold and the profits derived from such sale.

Design Patents.— Design patents are issued for any new or original design whether it be a work of art, statue, bas-relief, design for prints or fabrics, or for any new design or shape or ornament in any article of manufacture. The scope of the design patent was formerly very broad, but recent decisions and enactments have greatly restricted its availability and a design patent cannot now be obtained unless it possesses some inherent artistic quality. Mere utility is not sufficient to entitle a new design to letters patent. The terms of design patents are 3½, 7 or 14 years.

Caveats.— The law providing for the filing of caveats was repealed by Congress in the year 1910.

Assignments.— A patent or any interest therein may be sold or assigned like any other piece of property. An inventor may sell or assign his interest or a part interest in his invention, either before the application is filed or while the application is still pending. Under these circumstances the patent may be issued to the assignee or to the inventor and assignee jointly. The patent if already issued may be assigned by the owner whether he be the inventor or an assignee. The conveyance is effected by an instrument in writing stating the conditions under which the patent is assigned, and the assignment should be recorded in the Patent Office.

Foreign Patents.

Canada, Dominion of.— The laws of Canada follow somewhat closely the practice in the United States. The term of a patent is 18 years. The general practice, however, is to divide the fees, making payment only for a term of six years at one time. The patent is subject to taxation after the first term of six years. Applications are subjected to examination as to novelty and usefulness, as in the United States. The application must be filed in Canada within one year of the date issue of the United States or other foreign patent. If the inventor neglects to file his application within the 12 months, the invention becomes public property. It is not permissible to import the patented article into the Dominion after 12 months from the date of the Canadian patent. Within two years from said date the manufacture and sale of the article under the patent must have been begun. These exactions may be relaxed under certain conditions. The Canadian government may also endorse any patent as subject to the grant of licenses.

Great Britain.— The term of the patent is 15 years. Under the Patent Act of 1902 which went into force on 1 Jan. 1905, a limited examination is made to ascertain whether the invention is novel. In the examination, the Patent Office officials refer to all British patents, the applications for which were filed during the 50 years immediately preceding the filing of the application which is being examined. This examination is not as thorough in its scope as would at first appear, since publication in a foreign patent or in a periodical, while not preventing the grant of a British patent, may, in some cases, cause the British patent to be declared invalid by the courts. The application should, however, be filed before the invention is published in public print or becomes publicly known in Great Britain, except in cases where the application is filed under the provisions of the International Union. In Great Britain the true inventor should apply for the patent in his own name; but if the invention has been conceived in a foreign country, the first introducer may obtain the patent whether he be the true inventor or not. Under these circumstances, therefore, a foreign assignee may apply for the patent in his own name without the true inventor being made known. After the fourth year there are annual taxes, gradually increasing in amount. The patent should be worked in Great Britain within four years of the date of the patent, and is forfeited if work is suspended for one year. The 1918 Patent Bill contains a provision not heretofore compulsory, that the article patented must be made in Great Britain and declares the right of endorsing any patent as subject to the grant of licenses.

France.— The term of a patent is 15 years. There is no examination as to novelty and the patent is granted to the first applicant whether or not he be the true inventor. The patent must be worked in France within two years from the date of issue, and is subject to an annual tax. The life of the patent is conditioned on the payment of this tax and the grant is forfeited if work under it is suspended for two years. If these conditions are not complied with, the patent becomes public property, except when the patentee is a citizen or a subject of a country in the International Union, in which case the working should take place within three years of the filing of the application.

Germany.— The term of a patent is 15 years. The patent is issued to the first applicant, but if he is not the true inventor he should, before filing the application, obtain the written consent of the inventor. The application is subjected to a rigid examination. The patent is subject to an annual progressive tax and must be worked within a period of three years, but under a treaty it is not necessary for a United States citizen to work a patent in Germany provided the invention is worked in the United States.

Austria.— The term of a patent is 15 years. The practice is somewhat similar to the practice in Germany, although the examination is generally not so exacting. The patent is subject to an annual tax and it must be worked within a period of three years and is voided in case of a suspension of such work for one year.

Hungary.— The term of a patent is 15 years. The laws are similar to those of Germany.

Belgium.— The term of a patent is 20 years. The first applicant obtains the patent whether or not he is the true inventor. There is a small annual tax and the patent should be worked within one year of the working elsewhere. The patent expires if work under it ceases for one year.

Italy.— The term of a patent may be for one year, six years or 15 years. The patent is granted to the first applicant. The patent is subject to an annual tax and the working must take place within two years. The short term patents are void if work under them ceases for one year, and the long term if the suspension is two years.

Russia.— The term of the patent is 15 years. The patent is subject to the payment of annual taxes and must be worked within five years. A suspension of work for two years voids the patent.

Spain.— The term of the patent is 20 years, subject to the payment of annual taxes. It must be worked within three years. The patent expires automatically if work under it ceases for one year. The patent is issued to the first applicant whether or not he be the true inventor.

Switzerland.— The term of the patent is 15 years, subject to an annual tax. Working must take place within three years, but in the case of citizens of the United States working in this country is accepted as fulfilling the requirements. Only the true inventor or his assignee can obtain a patent.

Norway.— Term of patent is 15 years, subject to a small annual tax. The patent must be worked within three years and becomes void in case of a suspension for one year. The application must be filed in the name of the true inventor or his legal representative. Application must be filed within six months of the publication of any prior patent.

Sweden.— Term of patent is 15 years, subject to payment of an annual tax. The conditions are very similar to the laws of Norway, but the application should be filed before the issuing of a prior foreign patent. There is no specified time within which work under the patent shall begin.

Denmark.— The laws are similar to those of Norway.

Portugal.— The term varies from one to 15 years, the fees payable depending upon the term of the patent. Under the longer terms the patent must be worked within two years, and is forfeited in case of a suspension for two years.

Holland.— Term of patent is 15 years, subject to annual taxes and compulsory licenses. Applicant presumed to be the inventor. Application should be filed before invention becomes publicly known. The application is examined before the issue of the patent. It must be worked within five years after issue.

Commonwealth of Australia.— Following the Act of Confederation in Australia the patent laws underwent an entire revision. The law now in force enables an inventor, under one application, to protect his invention in the six states forming the commonwealth. The states which have confederated forming the commonwealth are Victoria, New South Wales, Queensland, South Australia, Western Australia and Tasmania. New Zealand is not a member of the commonwealth. The inventor or his assignee should apply for the patent. The application should be filed before the invention is publicly used or published in Australia, though a publication made more than 50 years ago is not a bar to the grant, unless it is shown that the invention has been used in Australia within 50 years. The term of the patent is 14 years, a tax being due before the expiration of the seventh year. When a patent is not worked within two years, the patentee may be compelled to grant licenses on such terms as the court may deem just.

New Zealand.— The application should be filed before the invention becomes publicly known or is publicly used in New Zealand. The inventor or his assignee should apply for the patent. The term of the patent is 14 years, taxes being due after the fourth year and manufacture must begin in New Zealand within three years.

British India.— The patent is granted for 14 years and closely follows the British practice. Is subject to annual taxes after four years and to compulsory licenses. Must be worked within four years. Where the inventor is not a party to application, the application must contain a statement of his name. Application must be filed before the invention is known or used in India.

Porto Rico.— It is possible to procure protection for industrial property by registering a certified copy of the United States patent with the civil governor and complying with the other legal formalities. The term is 17 years and no taxes are assessed against the patent.

Philippines.— The modus operandi is the same as that just described as applying to Porto Rico.

Cuba.— Since Cuba has become an independent republic, it has established a patent system. The term of the patent is 17 years. Working should be established within one year. No taxes are levied against the patent.

Mexico.— The term is 20 years. No taxes are due after the issue of the patent.

South American Republics.— Patents are issued by all the South American republics. The principal countries in which patent protection is sought are Brazil, in which the laws are quite favorable to foreigners, Chile and Argentina. Patents are also frequently secured in Venezuela, Peru, Ecuador, Colombia and Paraguay, but only for certain classes of invention, owing to the expense involved in procuring the patents. In *Argentina* patents are issued for terms of five, 10 and 15 years and are subject to an annual tax. Work under the patent must begin within two years and a suspension of such work for two years renders the patent void. In *Bolivia* the life of a patent is 10 years, during which period it is free of tax. A deposit of $150 is required as a guaranty that the patent shall be worked on Bolivian territory. In *Brazil* the life of the patent is 15 years, and an annual tax is levied. Manufacture under the patent must begin within three years, and a cessation of work under it for one year forfeits the grant. In *Chile* the patent runs for nine years and is free of tax. Manufacture under it must begin within two years and a cessation of two years renders it void. In *Colombia* the patent may run 10, 25 or 50 years, according to the character of the invention. It is free of tax for 10 years; must be worked within one year and is forfeited if work under it ceases for one year. In *Ecuador* the term of a patent is 10 years; no tax is levied; but work under the grant must begin within one year. In *Panama* patents are issued for terms of five, 10 or 15 years, and work under them must begin within 20 months for the short term and within five years for the long term. No tax is levied. In *Paraguay* the term is nine years, free of tax. There are no regulations as to when manufacture must begin. In *Peru* the life of the patent is 10 years, and it is free of tax. Work under the grant must begin within two years of its date. In *Uruguay* the term of the patent is nine years, and it is subject to an annual tax. The term within which work under the grant must begin is stipulated in the patent, and it becomes void if the work is suspended for one year. In *Venezuela* patents are issued for terms of five, 10 or 15 years, and are free of tax. Work under the short term must begin within six months, and under the long term within two years.

South Africa.—Patents were formerly issued by each of the four important states, Cape Colony, Transvaal, Kongo Free State and Orange Free State. In 1916 the Parliament of the Union of South Africa passed a general patent law replacing the several provincial laws. The validity of former patents and trade marks is preserved. Protection is granted to foreign patents only in case of countries granting reciprocal rights to citizens of the Union.

Japan has recently enacted a system of patent laws on a liberal basis. The term is 15 years, and taxes are levied after three years. Failure to operate under the patent in three years renders it void.

China has no patent laws nor patent office.

The conditions under which foreigners may file applications in the countries having patent laws vary very greatly and no attempt has been made to specify under what conditions applications may be filed. In most countries, however, the issuance of a prior foreign patent will either defeat the issuance of the patent subsequently applied for in another country, or will render the patent invalid even if it is issued. Great care should be taken, therefore, to avoid having a foreign patent issue at such a time as to endanger the life of the patent at home.

International Union for the Protection of Industrial Property.— The members of the union are Great Britain, United States, France, Germany, Switzerland; Spain, Belgium, Italy, Netherlands, Denmark, Norway and Sweden, Portugal, Mexico, Serbia, Tunis, Brazil, Guatemala, San Domingo, Australia, New Zealand, Dutch East Indies, Dutch West Indies, Japan and Cuba, Austria-Hungary and Ceylon. The subjects or citizens of each of the contracting states shall enjoy, in all the other states of the union, so far as concerns patents for inventions, trade or commercial marks and the commercial name, the advantages that the respective laws thereof at present accord, or shall afterward accord, to subjects or citizens.

It is not possible in the short space allotted for this article to explain at length the various provisions of the treaty. Suffice it to say that one of the principal advantages gained by the union is the greater liberality shown to inventors and the extension of the term within which they may apply for patents in foreign countries. Under the provisions of the Industrial Union. patents which would be lost or rendered invalid by the premature issuance of a prior foreign patent may thus be saved. By examining the list given above, it will be observed that all the principal countries in the world have become members of the union with the exception of Russia and Canada.

The Patent System an Industrial Foster Parent.— Probably there can be no better way of estimating the debt which the country owes to the patent system than by considering the growth of certain industries whose existence is dependent, either directly or derivatively, upon the patent laws. In the class of agricultural implements it is interesting to note that in 1850 the amount of capital engaged in this class of industry was only $3,564,202. The growth has been startling and continuous as will be seen from the fact that the capital in 1860 had increased to $13,866,389. In 1914 it had increased to $338,531,673, while the value of the products had increased from $20,831,904 in 1860 to $164,086,835 in 1914, giving employment to 48,459 wage-earners. It is also interesting to note that through the entire range of agricultural implements from the crudest implement to the most complicated machine, the evolution is dependent almost entirely upon the patented improvements which have produced newer and better articles and at the same time greatly cheapened the cost of production. In the class of sewing-machines the increase has been no less rapid. In 1860 the capital engaged in this class of enterprise was $1,494,450; in 1914, the amount of capital had risen to $34,467,000; whereas the value of the finished product had risen from $4,403,206 to $21,710,643. The automobile industry, founded largely upon the patent system, was represented in 1899 by 57 establishments employing 2,241 hands, and with a total invested capital of $1,379,000. The yearly output was valued at $1,253,000. In 1914 there were 300 establishments making automobiles and 971 making parts, besides 3,273 repair shops. They employed an aggregate of 152,039 hands; had a combined capital investment of $312,876,000, and the yearly product was valued at $503,230,000. The typewriter industry is almost entirely dependent upon patents, the increase being also striking. In 1890 there were 30 establishments, employing a capital of $1,421,783, and producing a product of $3,630,126; whereas in 1914, there were 107 establishments employing a capital of $30,988,000, and producing a product of $24,500,000. In electrical apparatus the inventions which have made possible the enormous growth of this industry have been almost entirely dependent upon patented inventions. In 1880 there were only 76 establishments and the capital employed amounted to $1,509,758: in 1914 there were 1,030 establishments and the capital invested amounted to $355,725,000, while the value of the product had increased from $2,655,036 to $335,170,000. The first phonographs and graphophones were produced in 1877. The annual products from this industry in 1914 amounted to $27,116,000. There are over 150 establishments engaged in the manufacture of photographic materials and apparatus. In 1899 there were only 11 establishments, with a total invested capital of $3,348,000, and a yearly product valued at $2,072,000. In 1914 the capital of these establishments amounted to $33,771,000, and the annual product amounts to $39,041,000. Many chemical processes are dependent entirely upon patents. Over $43,000,000 are engaged in the manufacture of glucose, yielding products to the value of over $52,615,000. The wood pulp industry is one which is dependent for its existence upon the patent system. It originated with the wood pulp patent of Volter in 1858, following with the soda fibre and sulphite fibre processes, and now shows a capital investment of $36,028,000 with annual products valued at $20,526,000. To Charles Goodyear is due the great impulse given to the rubber industry, owing to the introduction by him of the process of vulcanization. The amount of rubber and elastic goods and rubber boots and shoes now manufactured amounts to $300,994,000. The wonderful improvements which have been made in the iron and steel industry have originated in almost every case from patented inventions. In 1914 the number of blast furnaces, rolling mills, forges and bloomeries comprised 567 establishments, with a capital of $1,720,653,000, employing 278,072 wage-earners, who receive in wages $210,923,000; with products to the value of $1,236,319,000. The records of the printing industry are full of interest, owing to the number of establishments of which there is a record in the United States, amounting to 31,612. The capital employed amounts to $632,027,000, and the amount of products $803,237,000. It is safe to say that almost every article which the printer touches owes its origin to some patented device or apparatus.

The growth of the Patent System is also well illustrated by noting the increase in the number of patents issued from year to year. Between 1790 and 28 July 1836, only 9,957 patents had been issued. Between the years 1836 and 1850, 6,980 were issued, making a total of 16,937 up to 1850. During the year 1850, 884 patents were issued; during the years 1905–06, 31,837 patents were issued, and during 1911 the total number of patents issued reached the million mark. In 1918 the number of patents issued was 38,569, the serial number of the last issued in that year being 1,290,026.

The Patent Office.—The Patent Office is not an independent department of the government, but is a branch of the Department of the Interior. The Patent Office force consists of the Commissioner of Patents, about 400 examiners, including 45 principal examiners, two examiners of interferences, three examiners-in-chief, besides assistant examiners of various grades. The entire force of the Patent Office, including clerks, stenographers, messengers, etc., amounts to 800 persons. The year's work in the Patent Office comprises the comparing of some 70,000 applications with the patents previously allowed — about 1,300,000. This is an amount of business double that of any other patent office in the world, and 30 per cent more than for the whole British Empire together. The average time of prosecution of a patent is 21 months, but many take longer, and there is a considerable number which have been pending for five years, and some which have been under consideration for 15 years. The department is housed within the Patent Office building at Washington. The quarters, formerly cramped and inadequate, have been enlarged by the withdrawal of the Department of the Interior to its own building. The fact that more modern and commodious quarters are not allotted to the Patent Office is due to no lack of funds on the part of the patent department, which is a paying institution. The business of the office shows a profit during the fiscal year ending 30 June 1910, of $19,824.75; this being the total excess of receipts over expenses for the fiscal year. The balance in the United States treasury due to the Patent Office amounted on 1 Jan. 1918 to $8,219,071.35. The surplus usually amounts to over $200,000, but the Patent Office is not allowed to make use of this sum, as it can only use the amount of funds provided by Congress for the running expenses of the office, amounting to about $2,000,000 annually. The appropriation is often inadequate, and the work of the office is thus hampered by lack of funds. It is to be hoped that at some future time the large fund now deposited in the United States treasury to the credit of the Patent Office may be used in the erection of a modern building designed especially to perfect and facilitate the work of this most important department of the government.

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PATER, pā'tėr, **Walter Horatio**, English essayist: b. London, 4 Aug. 1839; d. Oxford, 30 July 1894. He was educated at King's School, Canterbury (which he describes most exquisitely in his "imaginary portrait" of 'Emerald Uthwart') and Queen's College, Oxford, and in 1864 became a Fellow of Brasenose College. He had at first intended to take orders in the Church of England, and then, as his views changed, had thought of becoming a Unitarian minister, but in 1864 he had abandoned both projects, and while perhaps not entirely abandoning belief in Christianity came to regard religious themes from a standpoint almost purely philosophical. Out of the strong religious tendencies of his youthful days grew his later desire to interpret to his age the spirit of that of the past, and more especially of the Renaissance in literature and in art. His first published work was 'The Renaissance: Studies in Art and Poetry' (1873), which brought him a select if not a wide circle of enthusiastic admirers. It was followed by 'Marius the Epicurean: his Sensations and Ideas' (1885), a highly subjective study of the mental history of a Roman youth represented as living in the time of Marcus Aurelius. These two works exhibit to the full their author's peculiar characteristics of style, the most precise statement of thoughts and impressions, the utmost delicacy and refinement and rhythm whose charm is rarely surpassed, a subtlety that perplexes and obscures at times, and a serious want of vigor. While 'Marius' remains, perhaps, his greatest achievement, his 'Imaginary Portraits' (1887) is his most thoroughly delightful work. In the same vein as the four stories in this latter volume are 'The Child in the House' (1894) and the 'Esmerald Uthwart' and 'Apollo in Picardy' included in the 'Miscellaneous Studies' (1895). His other volumes comprise 'Appreciations' (1889); 'Plato and Platonism' (1893); 'Gaston de Latour,' an unfinished romance (1897); 'Greek Studies' (1897). Pater's style is peculiarly his own and represents the extreme limit of ultra-refinement attained in English prose in the 19th century. It does not stimulate, it is true, but its charm is very great. (See MARIUS THE EPICUREAN). Consult Greenslet, 'Walter Pater' (1903).

PATERA, an ancient flat vase or plate, usually made of gold, silver, bronze or marble, in which the Greeks and Romans offered wine to the gods at festivals and sacrifices. In architecture, the representation of a flat, round dish, used as an ornament in friezes and other decorations. The ornament appears to have had, in the beginning, a mythological and sacred character, as had practically all primitive decorations, especially those connected with temples, shrines and sacred places in general. The patera ornament which in the beginning was a sculptured representation of the patera dish, assumed various forms in later architecture when the sacred character of its origin was forgotten. Rosettes and flat ornaments of different shapes bearing no resemblances to the original patera are now named after it.

PATERCULUS, pą-tėr'kū-lŭs, **Gaius Velleius,** Roman historian: b. Campania about 19 B.C.; d. after 31 A.D. In boyhood he entered the army and later was with Tiberius in Germany, Pannonia and Dalmatia. He was a favorite with Tiberius, and when the latter became emperor in 14 A.D. he made Paterculus prætor. Further details concerning his life are lacking, but his death is supposed to have occurred about 31 A.D. His reputation as a historian rests chiefly upon his 'Historiæ Romanæ' (in two books, Basel 1520), which purports to be a universal history though really dealing chiefly with that of Rome. It begins with a full and valuable account of the fall of Troy, but is unfortunately not quite complete, the beginning and a part following the eighth chapter being lacking. The style is excellent and the character drawing is forcible. There have been many editions of the work, among them Burmann's (1719); Ruhnken's (1779); Orelli's (1835); Kritz (Leipzig 1840); Halm's (1876); Rockwood (Boston 1893). Consult Teuffel, W. S., 'Geschichte der Römischen Literatur' (Vol. II. Leipzig 1910).

PATERNO, pą-tĕr'nō, Sicily, city in the province of Catania, 11 miles northwest of Catania by rail, at the southern base of Mount Etna. There is a Norman castle, dating from 1073, which was erected on the site of the ancient Hybla or Galeatis; it has a tower and a chapel whose frescoes were executed in the 14th century. There are remains of mosaic pavements, baths and an ancient bridge over the Simeto. There are mineral springs and the city has a trade in oil and wine. Pop. commune 28,923.

PATERNOSTER, pā'tėr-nŏs'tėr, the opening words of the Latin version of the Lord's prayer, hence employed to denote the prayer itself. This prayer was given on two different occasions: first, in the sermon on the mount, when Christ, addressing the multitude, warned them against the vain repetitions of the hypocrites and heathens in prayer. On the second occasion it was cited to certain of his disciples, when it was introduced by the words, «When ye pray, say, Our Father» (Luke xi, 2-4). Its use in the liturgy or Holy Communion service is frequently alluded to in the writings of the early church fathers. So deep was the veneration for it that none but baptized persons were allowed to use it. Among the earliest patristic writings after the apostolic age there are two commentaries on this prayer — one by Tertullian and another by Cyprian — both written within about a century and a half after the death of Saint John the Divine. Since the 13th century the Lord's prayer has been in common use in church services. The name is also applied to the large beads in a rosary, which are called «paternosters.» In the formal devotions among Roman Catholics the paternoster is repeated a stated number of times and the Ave Maria repeated once at least, but usually oftener.

PATERNOSTER ROW, a London street, north of Saint Paul's, long famous as the centre of the book-publishing business of the city. Its name is said to be derived from the prayer books and rosaries sold there.

PATERSON, Andrew Barton, Australian poet and journalist: b. Narrambla, New South Wales, 17 Feb. 1864. He studied law and finally turned to journalism in 1886; and ultimately became editor of the *Town and Country Journal,* Sidney. He writes under the pen name of «Banjo.» As a special war correspondent for Reuters Agency, the *Sidney Morning Herald* and the *Melbourne Argus,* he went through the South African War and visited the Philippines, China and the New Hebrides for the *Herald.* In 1902 he wrote special articles on the Australian labor question for the *London Times* and he was editor of the *Sidney Evening News* (1903-06). Among his published works are 'The Man from Snowy River,' a volume of stirring narrative verse of which 32,000 copies were sold within a short time after publication; 'Rio Grande's Last Race and other Verse'; and 'Old Bush Songs.' He has also published a successful novel, 'An Outback Marriage.'

PATERSON, John, American soldier: b. New Britain, Conn., 1744; d. Lisle (now Whitney's Point), N. Y., 19 July 1808. He was graduated from Yale in 1762 and he engaged in law practice at New Britain; but in 1774 he removed to Lenox, Mass., where he continued his practice, and in that year was elected a member of the Provincial Congress. In 1775, after the battle of Lexington, he joined the Federal Army. Under his supervision the first redoubt at Boston was constructed, and he defended it with his men at the battle of Bunker Hill. He served in Canada and later under Washington in New Jersey, participating in the battles of Trenton and Princeton. In 1777 he was made brigadier-general. In the battle of Stillwater and at the defeat of Burgoyne he performed distinguished service, and later he was at the battle of Monmouth. He was mustered out of service as major-general in 1783 and subsequently joined the militia during Shays' Rebellion in 1786. In 1794 he removed to Lisle, N. Y., and afterward served four terms in the legislature. He was the first presiding judge of Broome County, N. Y., and a member of Congress in 1803–05, after which he lived in retirement.

PATERSON, John, American mathematician and actuary: b. near Morristown, N. J., 1801; d. Albany, N. Y., 1883. After the early death of his father at Hamilton, Canada, he pursued his education while learning the printing trade at Buffalo. Having completed his apprenticeship, he found his way to Albany, N. Y., in 1823 and shortly after his arrival became associated with the Van Benthuysen Company, State printers. Meanwhile his aptitude for mathematics and the sciences led him to study the languages, ancient and modern. He was honored in 1833 with election to the Albany Institute and in 1835 with the master's degree from Union College. He declined an appointment to the Smithsonian Institute and other preferment, and was engaged for some years in the press corrections of the monumental 'Natural History of New York.' In 1851 he became State superintendent of weights and measures, and at the erection of the State insurance department in 1860 became its mathematician and then its actuary, retiring in 1874. His only son, JOHN SHERMAN PATERSON, b. 1849; d. Albany, N. Y., 1917, inherited his mathematical ability and served the actuarial bureau of the New York Insurance department for 50 years, 35 of which he was head of the bureau and supervised an astonishing development of insurance and expansion in many new lines. He was member and Fellow of the Actuarial Society of America from its foundation in 1889. He revised and extended the tables of policy valuation constructed by his father and which are in general use.

PATERSON, Robert, Scottish stonemason, immortalized by Scott as «Old Mortality»: b. near Hawick, Scotland, 1715; d. Bankend, England, 29 Jan. 1801. He served his apprenticeship as a stonemason with his brother near Lochlaben, and in about 1740 married and rented a quarry, making a business of carrying gravestones to Galloway. His house was burned, and he was taken prisoner on the retreat of Prince Charles in 1745 because, it is said, of the fact that he was a Cameronian. While in England he became so interested in restoring and erecting headstones on the graves of the Covenanting martyrs that when released he remained with his family only a short time, and in 1758 deserted them, devoting the remainder of his life to the «unusual business of his pilgrimage.» The story as told to Scott by Joseph Train became the foundation of the novel, 'Old Mortality.'

PATERSON, William, English financier, founder of the Bank of England: b. Skipmyre, Dumfriesshire, April 1658; d. London, January 1719. He was brought up in England, may have been a peddler in his early days, but soon became a well-to-do merchant, and at 23 a member of the Merchant Taylors Company. He took part in planning the revolution of 1688; as early as 1691 proposed the formation of the Bank of England and in 1694 became one of its directors. In 1695 he attempted to carry out a long cherished scheme of a free commonwealth and emporium of trade in Darien; the colony was entirely unsuccessful, and Paterson for a time lost his reason. On his return to Great Britain he promoted the Walpole Sinking Fund, the scheme of 1717 for the conversion of the national debt, and the Union of Scotland and England. Paterson wrote several pamphlets on economic and political questions. Consult the 'Life' by Bannister (1858).

PATERSON, William, American jurist: b. at sea 1745; d. Albany, N. Y., 8 Sept. 1806. He was brought to America by his parents when a child, was graduated from Princeton in 1763, admitted to the bar in 1769 and engaged in practice in New Jersey. In 1776 he was a delegate to the New Jersey State constitutional convention and was appointed attorney-general of the State in that year, which office he held for 10 years. He was a delegate to the Continental Congress in 1780–81, and in 1787 a member of the National constitutional convention, where he proposed the «New Jersey plan,» which was to leave in the hands of the «sovereign States» practically all laws excepting those concerned with regulating commerce, levying duties and providing the means of war. There was to be one legislature in which each State should have one vote, and all executive and judiciary committees were to be removable by Congress. This plan was opposed by Edmund Randolph, who presented the plan for a national government, and ultimately the two plans were merged in one and adopted. He was United States Senator from New Jersey 1789–90, governor of New Jersey 1791–93, and was appointed by Washington associate justice of the Supreme Court in 1793. The city of Paterson, N. J., was named in his honor. His letters have been published and edited by Mills, under the title of 'Glimpses of Colonial Society and the Life of Princeton College 1766–73, by One of the Class of 1763' (Philadelphia 1903).

PATERSON, William, Canadian statesman: b. Hamilton, Ontario, 19 Sept. 1839. He early entered business life, in which he was markedly successful. He was mayor of Brantford in 1872–73, and a member of the Canadian House of Commons in 1872–1911. He entered the Laurier Cabinet as Controller of the Customs in 1896, and was appointed Minister of Customs of Canada in 1897, which office he occupied until 1911. He was actively connected with the framing of the new customs tariffs of 1897 and 1907; and in 1911 was one of the Canadian representatives conducting reciprocity negotiations at Washington, D. C.

PATERSON, William Romaine (pseud. BENJAMIN SWIFT), British novelist: b. Glasgow, 29 July 1871. He was educated at Lausanne and at Glasgow University afterward traveling in Europe for the purpose of acquiring foreign languages. Author of 'Nancy Noon' (1896); 'Siren City' (1899); 'Sordon' (1902); 'The Nemesis of the Nations' (1907); 'The Old Dance Master' (1911); 'The Lady of the Night' (1913); 'What Lies Beneath' (1917), etc.

PATERSON, N. J., industrial city, the third in population in the State and the capital of Passaic County, situated 17 miles northwest of New York City, on the Passaic River, which for several miles, on the east and north, forms the boundary line of the municipality. The city is built chiefly on a plain surrounded on the north and west by high hills. A portion of the town, however, is situated on the hills rising from the north bank of the river and on the high ground around the point where the Passaic River makes its way through the hills and descends to the level of the plain over the celebrated Passaic Falls. The descent is about 70 feet; the perpendicular fall being some 50 feet. In the abundant power afforded by this waterfall is found the reason for founding the city at this point, and its growth to one of the most important manufacturing centres of the country. The population has grown from 7,596 in 1840 to over 140,000 in 1919. Over 50,000 of its population are of foreign birth. Three important railway lines pass through Paterson: the Erie, Delaware, Lackawanna and Western and the New York, Susquehanna and Western.

Paterson is called "The Lyons of America," because it is the principal silk manufacturing centre of the Western hemisphere. In 1900 the number of silk mills in the city was 136, with a total capital of $19,025,564, employing 15,943 wage-earners (exclusive of salaried officers and clerks), whose total annual wages amounted to $6,291,998. The value of the product of these mills was $26,006,156. In 1917 the silk plants had increased to over 400. There were also 30 establishments engaged in dyeing and finishing textiles — almost exclusively silk — with combined capital of $2,826,293, employing 2,707 workers, whose wages amounted to $1,184,764. The total product of these dyeing establishments was valued at $3,836,409. The total annual product of the silk manufacturing business, therefore, including dyeing and finishing, amounted in 1900 to $29,842,565; this being considerably more than half the total value of manufactured goods of all kinds produced in the city. In 1902 according to the New Jersey bureau of statistics the value of the product of the silk industry had increased to $32,896,717. Steel and iron manufactures rank second in importance. There were in this line 37 establishments with capital amounting to $6,668,425, employing 3,854 wage-earners, who received $1,844,745 in wages. The value of the product was $5,906,517. In 1902 the product of this industry amounted, according to the State bureau of statistics, to $10,117,480. The greater part of the steel and iron business is done by the two great corporations engaged in the manufacture of locomotives. This has long ranked second in importance among the industries of Paterson. The city having been one of the two or three earliest to engage in the manufacture of locomotives it has ever since ranked among the most important centres in the country for this industry. Brewing ranks fourth in value of annual product. The capital invested is reported as $5,685,849; number of persons employed 245, earning $167,575, and the value of the product $1,859,537. Condensed statistics as given in the United States Census Report for 1900 of the total manufactures of Paterson in 1890 and 1900, are as follows: Capital invested in 1890, $27,603,549; in 1900, $43,510,481. Value of products, 1890, $42,263,531; 1900, $52,287,975. Average number of wage-earners, 1890, 23,198; 1900, 30,190. Total wages, 1890, $10,439,725; 1900, $12,812,538.

The number and variety of smaller industries is considerable, and it is noteworthy that the decade above reported upon shows an increase of over 66 per cent in the number of establishments and 23 per cent in value of products.

Banks.— Paterson has three national banks with a combined capital and surplus of about $2,000,000, and six savings banks and trust companies. The oldest of these, the Paterson Savings Institution, now in its 51st year, has deposits amounting to $17,500,000 and resources, $19,500,000.

The city government comprises a mayor, board of public works, board of finance, board of fire and police commissioners, elected for two years, 11 aldermen who have power over excise matters only, commissioners of public instruction, park commissioners, commissioners of assessment of taxes, board of health and Free Public Library trustees. The various commissions are appointed by the mayor, and, with the exception of one or two, confirmed by the board of aldermen. The tax levy for the year 1903 was $1,360,776.

The public school system is efficient and progressive. There are 26 public schools, including the high school and 26 school buildings. The number of pupils registered is 22,000 and the number of teachers employed, 625. The total appropriation for the department of public instruction is $325,750, of which $277,250 is required for salaries. There are also a half dozen or more private schools, some of them of excellent standing.

The Free Public Library is managed on progressive lines and is popular and successful. The building and all except some 3,000 of its 36,000 volumes were destroyed in the great fire of February 1902, but prompt measures were taken for re-establishment, and in two years 18,000 volumes had been collected in the temporary building, and a new, carefully planned and beautiful building, costing $200,000, was far advanced toward completion. There are also four branches in different sections of the city. There are published in Paterson, three daily newspapers and five weekly (two in Dutch) (two Italian).

There are upward of 75 churches in Paterson, representing nearly all the principal denominations. The most prominent are the Presbyterian, Episcopalian, Methodist Episcopal, Reformed and Roman Catholic. There are also three Jewish synagogues. There are a flourishing Y. M. C. A. and Y. W. C. A., each with a handsome building. There are three large and well supported hospitals — the General Hospital and Saint Joseph's, Miriam Barnet Memorial Hospital — also an isolation hospital for contagious diseases which is considered a model among institutions of its kind; two orphan asylums, an Old Ladies' Home and a Children's Day Nursery with a building erected by Mrs. Garret A. Hobart.

About six miles of the more important streets of Paterson are paved with vitrified brick, three and one-half miles with asphalt, four and one-fourth "Belgian block," and some 63 miles are macadamized. Paterson has three parks of moderate area, but well kept, presenting pleasing examples of landscape gardening and affording somewhat exceptionally picturesque and charming distant views. The parks are situated one at either end of the town and both border on the Passaic River. The Eastside Park contains 60 acres and the Westside 30 acres. There are also 23 small parks scattered throughout the city. Also situated one at the east, the other at the west side of the town, are two cemeteries, beautifully laid out. In Cedar Lawn Cemetery is the costly mausoleum of the late Hon. Garret A. Hobart, Vice-President of the United States.

The city contains a considerable number of handsome buildings. The most important buildings in the business section are the city hall, and on the square surrounding it, five modern and costly bank buildings, several large office buildings and a block below the building of the Paterson Savings Institution. Main street contains large and handsome department stores of metropolitan character and appointments. The new county court house is built of white marble at a cost of about $400,000. Adjoining the court house is the new post-office and opposite the high school costing almost a million dollars. One block to the east of the city hall stands the Hamilton Club, the handsomest clubhouse in New Jersey. The most notable churches are the Church of the Redeemer, Presbyterian, Saint Paul's Protestant Episcopal, Saint John's Roman Catholic, Saint Joseph's Roman Catholic, and the Second Presbyterian. The Danforth Memorial Library building is perhaps the most notable and beautiful public building in the city. It was erected in 1903–04 as a memorial to the late Charles Danforth, with funds presented to the public library trustees by his daughter, Mrs. Mary E. Ryle.

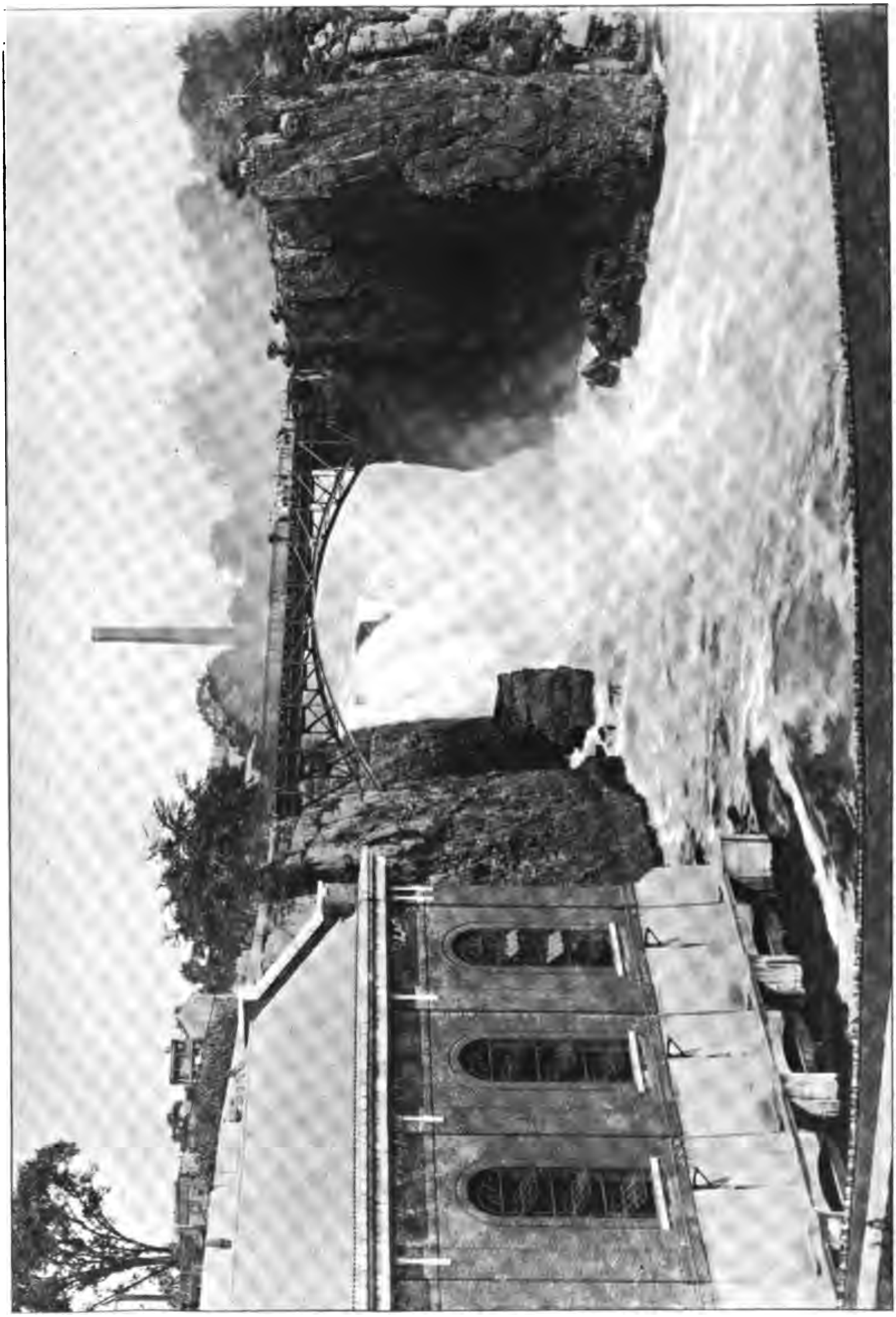
The town of Paterson was founded by, or had its origin in the «Society for Establishing Useful Manufactures,» which was chartered by the legislature of New Jersey in 1791, and in the summer of 1792 the site, by the «Great Falls of the Passaic» was fixed upon as the location for the mills and the town. The charter of the society was drawn up by Alexander Hamilton, who was greatly interested in founding a system of American manufactures. He has often been considered the founder of Paterson and there is evidence that he influenced the newly-formed corporation in selecting the site for the town, but he appears to have had little connection with the enterprise afterward. Cotton manufactures were the first, and for many years the most important carried on, but have long since been superseded. Woolen and paper manufactures were also extensively carried on in the early and middle part of the last century, and it was in Paterson that Samuel Colt manufactured the first of his revolving pistols. His venture in Paterson, however, was not a success. The first locomotive manufactured in Paterson was finished in 1837 after 16 months' labor upon it. It was not until 1840 that the silk industry was successfully established by John Ryle, a young Englishman who had recently come to this country. From very modest beginnings silk manufacturing in Paterson has advanced in 60 years to the vast proportions shown in the statistics at the beginning of this article. At midnight on Saturday, 8 Feb. 1902, a fire broke out in the lower part of the city west of Main street, and rapidly burned its way through the very heart of the business section of the town. The fire was not subdued until Sunday night. The public library, two bank buildings, five churches, the largest stores and other prominent buildings and about 250 dwellings were destroyed. The city hall and the Hamilton Club, two of the best buildings in the city, were burned out, but the walls were left intact and the exteriors not seriously damaged. The total loss was $6,000,000, on which insurance was paid to the amount of $4,011,000. The mayor promptly declined all outside aid, the citizens raised a large fund for the relief of the destitute, and immediately set to work to rebuild the city far better than before. In less than a month another calamity came upon the city in the shape of the greatest flood ever known in the Passaic Valley. Great loss of property followed in Paterson, and hundreds of the poorer class were again driven from their homes. In October 1903 another great flood occurred, causing heavy loss. The city, notwithstanding, is prosperous and progressive.

JOHN J. FITZGERALD,
Secretary Paterson Chamber of Commerce.

PATHÉ, pạ'tā, **Charles**, French photographer and pioneer in the motion picture trade: b. Paris, about 1873. In 1896, in conjunction with his brother Emile, and two others, he founded the now well-known firm of Pathé Frères. The firm started with two kinetoscopes, in which by dropping a coin, one was privileged to see a succession of tiny photos tumbling over one another and giving the effect of life action. The machine had been invented by Edison in America and copied in England by Robert Paul, who delivered the machines to Pathé. The firm members had each contributed less than $500 and after a time two withdrew, leaving the Pathé brothers to carry on the business alone. It was soon found necessary to change the kinetoscope pictures frequently. Charles purchased 20 additional machines, placed them in 20 different towns and switched the pictures in weekly rotation. Thus was born the first picture exchange on 6 June 1894. C. Francis Jenkins projected pictures from moving celluloid film on the wall of a jewelry store at Richmond, Ind. Not until two years later did his invention attract general attention. Pathé, meanwhile, had secured Lumière's motion picture camera, then just completed, and began to take his own pictures 10 or 15 feet at a time. His projection apparatus was still imperfect; for a time he was his own cameraman, shipping clerk, manufacturer, salesman and demonstrator. Later with the development of improved projection apparatus in America the Pathé firm entered on the production of photoplays. The one-room factory of 20 years ago is represented by a $2,800,000 concern in Joinville, France, with branches in England and the United States, and offices and exchanges in all parts of the world. The Pathé news film is familiar to all patrons of the cinema. The French government has made M. Charles Pathé a chevalier of the Legion of Honor.

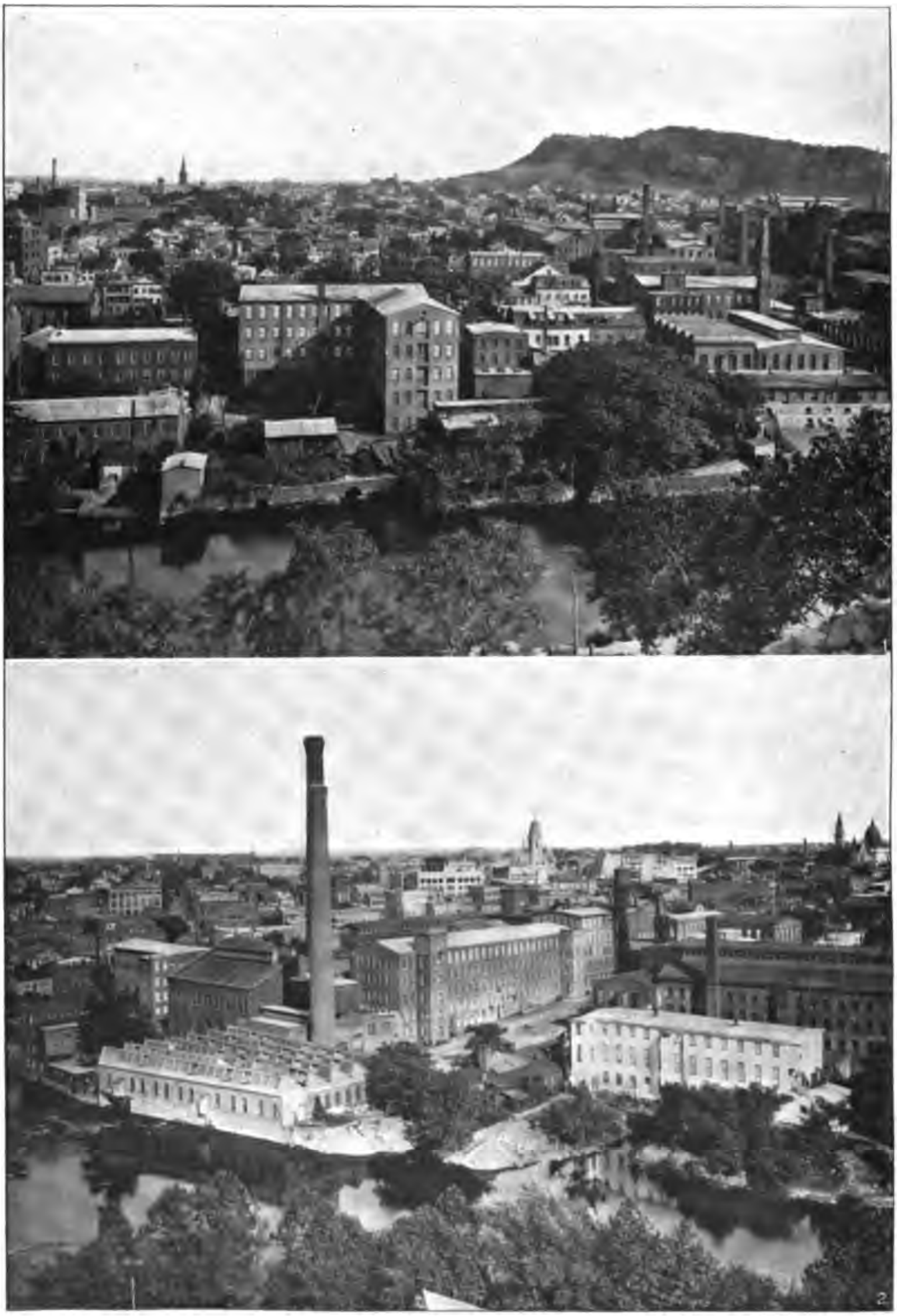
PATHELIN, pạt'lăṅ', **Maistre Pierre**, marks the beginning of French comedy with a work still admired for its comic force and resourceful exploitation of dramatic possibilities. Authorship and date are not established, but the original Pathelin farce, ‘Maister Pierre

PATERSON, N. J.



Passaic Falls, Paterson, N. J. The falls are within the city limits, about a half mile from the City Hall

PATERSON, N. J.



Views of the western and central sections of the city taken from the heights near Passaic Falls—Garret Mountain in the right background

Pathelin' was probably written and first acted between 1467 and 1470, and many signs point to the lawyer, ecclesiastic and poet Pierre Blanchet of Poictiers (1459–1519) as its author. Its immediate popularity is indicated by imitations, 'Le Nouveau Pathelin' of 1474 and 'Le Testament de Pathelin' of about 1485, and also by familiar allusions in the works of Villon, Coquillart, Gringoire and others. It penetrated to England and to Germany, was turned into Latin by Reuchlin as 'Scenica progymnastica' and was acted by his pupils at Heidelberg (1497). A more faithful Latin version by Connibert, 'Patelinus alias veterator, nova comoedia,' appeared in Paris in 1512. The French play was printed with gradual modernizations 25 times before the end of the 16th century and twice in the 17th. In 1706 Brueys used the plot for his 'L'Avocat Pathelin,' and the old play, though commended by Molière and La Fontaine, suffered passing neglect. It was twice printed in its early form in the 18th and often in the 19th century, most elaborately by Genin (1854), most conveniently with its companion pieces by Jacob in 'Recueil des Farces' (1876). The farce tells in lilting octosyllabic couplets how Pathelin, a lawyer, buys cloth with no intention of paying for it, tricks the merchant, but is himself tricked by a shepherd client who uses the stupidity which Pathelin had taught him to feign, to defraud the counselor of his fee. There is a prose translation, with introduction and stage directions, by R. Holbrook, Boston, 1905 and 1914.

PATHFINDER, a nickname given Gen. John C. Frémont (q.v.) because of his explorations of the Far West from 1837 to 1853.

PATHFINDER, The. 'The Pathfinder; or the Inland Sea,' third in the order of events of Fenimore Cooper's Leather-Stocking tales, was published in 1840, 13 years after Natty Bumppo had ended his career in 'The Prairie.' Although Cooper had questioned the wisdom of reviving that hero, and although he was at the time engaged in fierce litigations with the newspapers, he brought to his task the remarkable freshness and vigor with which he always handled the fortunes of his chief character. It is true that 'The Pathfinder' shows Natty at his old trick of guiding tender damsels through the dangerous woods, and that the siege at the blockhouse and the storm on Ontario are considerably like other of Cooper's sieges and storms. The book suffers little, however, from these parallelisms. Chingachgook has all his proud, affecting, forest stoicism and competence. Natty, here commonly called La Longue Carabine, keeps in a hardy middle age his simple and honest nature, which is severely tested by his love for a young girl. She is a conventional heroine of romance who would not have deserved Natty had she loved him. But a certain soft amiability about her turns for a time, and convincingly enough, all the thoughts of the scout to the world of domestic affections. More talkative than ever before, he reveals new mental and moral traits. With the same touch of realism which had kept Uncas and Cora apart in 'The Last of the Mohicans,' Cooper separates these lovers, not, of course, without certain fine gestures of renunciation which have the due romantic flavor, sends her to the arms of a younger suitor, and restores the hero to his true home in the wilderness. The adventures of the plot are varied and stirring, particularly those on the water, which take authority from the fact that Cooper had as midshipman actually seen service on Lake Ontario. In language, method, ideas 'The Pathfinder' resembles the rest of the series, but it is a real distinction to be the only book which shows Natty Bumppo in love and the first which made important imaginative use of the Great Lakes.

PATHOLOGY (Gr. πάθος, suffering and λογια, doctrine of disease) is the science which treats of all departures from the normal condition of the animal or plant. Owing to the great range of variation in the anatomy and functional behavior of organs and tissues, it is difficult to set up a standard which may be considered as normal, and we are forced to adopt for this purpose the usual or average condition. Pathology treats of all abnormalities in the process of development of the individual and of their results. It considers all the untoward results of outward influences, be they physical or chemical, or of those more complex influences which we may designate biological, as well as those subtle characters of the organism itself which, often hereditary, render it more or less prone to these influences, and give it the power of arranging a protection for itself and recovering its normal state.

Historical.— Within recent centuries the various subdivisions of pathology have acquired such importance and have been so systematically studied as to constitute almost independent sciences. The science of pathological anatomy, for example, is a development of the last 300 years, while that of pathological chemistry dates only from the middle third of the 19th century. Pathology in its broad sense, however, must be recognized as existing, though in a crude and imperfect form, even in the very beginnings of science. Throughout the history of medicine the student must observe the distinction between the products of objective investigations — the direct observation of nature — and the ever-recurring philosophical or speculative systems of medicine built upon some fanciful or arbitrary foundation and rounded off with apparent logic to satisfy the innate cravings of man for order and completeness. To the former is due the real and steady progress of medicine, while only too often the systems based on speculation have retarded progress. Observation and hypothesis are, however, so mixed together and entangled that it is not possible to consider one without the other.

The earliest beginnings of pathology are to be found in the writings of the Hindus, Chaldæans, Chinese and Egyptians, where, although medicine was under the sway of priests, and incantations were the main therapeutic agencies, there can still be recognized a vague knowledge of the more obvious diseases. In Greece the records contain only similarly obscure conceptions until about 400 B.C., when there arose the Hippocratic school, of which the most important writings are attributed to Hippocrates himself. The great services of this school lay in their separating medicine from religion, in making abundant accurate observations on the symptoms and course of diseases, and in instituting a rational hygienic and dietetic system in the treatment of disease. The pathology of Hippocrates was a humoral pathology with only the most meagre basis of anatomy or physiology, inasmuch as human dissections were not practised. The next advances were made by the Greeks in Alexandria, where the study of anatomy flourished under Herophilus and Erasistratus about 300 B.C. In Rome, Celsus, Aretæus, and above all, Galen, who lived in the latter half of the 2d century, contributed not only to the knowledge of disease, but also to that of anatomy and physiology; and Galen, adopting and expanding the Hippocratic teachings, so welded together the knowledge of the times, filling the gaps by ingenious speculation, that his system, treating of the whole realm of medicine, became supreme in its apparent infallibility, and dominated medical thought and practice until the 16th century. During all this time no important advance was made, the literature consisting largely of compilations and translations, preserved and transmitted to western Europe by the Arabs, all difficulties being decided by a reference to the authority of Galen. With the revival of learning and the introduction of the practice of dissecting the human body there arose those great medical reformers, Vesalius and Paracelsus, who pointed out errors in Galen's system. The former overthrew his supremacy so far as it referred to anatomy, and the latter endeavored to break the shackles of all authority and tradition. In the 17th century Harvey by his discovery of the circulation of the blood completed this overthrow from the physiological side. These men, however, formed no satisfactory substitutes for the universal authority in medicine of Galen, and to satisfy this craving numerous more or less fanciful systems arose in the 17th and 18th centuries, which were concerned mainly with the nature of the processes of life, and made sweeping generalizations as to the relation of these to the pathology and treatment of diseases. Descriptive anatomists, such as Malpighi, by the aid of the newly improved microscope added greatly during his period to the store of anatomical knowledge which Vesalius had so enriched. It was not until the latter half of the 18th century, however, that there began with Morgagni, John Hunter, and his nephew and pupil, Matthew Baillie, the systematic study of pathological anatomy. In Morgagni's book, 'De Sedibus et Causis Morborum' (1761), we have really the foundation of that study, and the museum of Hunter has formed a model for similar institutions all over the world. Great progress resulted in this century too from the studies of Haller and Wolff in the domain of physiology and embryology — all this regardless and, indeed, in spite of the ever-recurring speculations and systems which occupied so dominant a place in the medicine of the period.

The 19th century was ushered in by the epochal researches of Bichat, who, in recognizing the tissues and studying disease with reference to them, rather than to regions or organs, made an advance overshadowed only by the later discovery of the cell. Following him came the Parisian school of pathological anatomists including Corvisart, Laënnec, Cruveilhier and others, whose teachings were carried to England and Germany by their many scholars. Rokitansky (1804–78), by taking advantage of the extraordinary opportunities offered in Vienna, greatly advanced the knowledge of pathological anatomy. Doubtless the greatest name in the history of pathology is that of Virchow (1821–1902), who, spurred on by the discovery of the cellular structure of plants and animals by Schleiden and Schwann, soon convinced himself that every animal tissue is composed of and derived from cells, that no cell arises except as the offspring of a previously existing cell, and that spontaneous generation of cells is impossible. The application of these fundamental ideas to pathology resulted about the middle of the 19th century in the establishment of the doctrine of cellular pathology, which inaugurated the most important epoch in that science. The enormous amount of work which has followed has been entirely a confirmation and elaboration of these principles. The value of the experimental method, which has contributed so largely to exact pathological knowledge, although introduced by John Hunter and practised by Virchow and others, came into full general recognition especially by the work of Traube and of Cohnheim (1839–84).

During the last three decades of the 19th century the researches of Pasteur and of Koch, who have been followed by many workers in the fields opened by them, have shown the paramount importance of the relation of microscopic plants and animals to the production of disease. Physiological chemistry, established as a science by Liebig in the middle third of the 19th century, has cleared up many obscure problems. More precise methods of clinical research and experimental study of the problems of pathological physiology have added their important results. The last decade has been marked especially by those investigations into the laws of immunity which have been crowned with such brilliant success and have conferred such inestimable practical benefits on mankind, the names of Metchnikoff, Behring and Ehrlich being most prominently associated with these advances.

Definitions and Classifications.—Although human pathology in its broadest sense comprehends the entire science of medicine, as distinguished from the practice of the medical art, the term is sometimes used in a restricted sense as equivalent to pathological anatomy, the knowledge of which first placed pathology upon a scientific foundation. This knowledge is obtained by post-mortem examinations and by microscopical study of diseased tissues (pathological histology). But not less important than the knowledge of morbid structure is that of the altered activities or functions of the body in disease. This latter branch of pathology, which is called pathological physiology, rests upon clinical observations and upon experiment (experimental pathology). Even in the more comprehensive works on pathology it is customary to include only a relatively small part of the subject matter of pathological physiology, the larger part being assigned to works on clinical medicine. Both pathological anatomy and pathological physiology have been greatly advanced by the aid of chemistry (pathological chemistry). The term "general pathology" is used to include both general pathological anatomy and general pathological physiology, and embraces the consideration of such topics as the nature and causes of diseases, morbid processes common to many diseased conditions and disturbances of function resulting from such processes. What is known as etiology, or the causation of diseases, is a subject of such extent and complexity that only certain of its aspects are usually treated of in works on pathology, other aspects being referred to the departments of hygiene, including bacteriology and clinical medicine. The terms comparative pathology, animal pathology and vegetable pathology are self-explanatory. The limitations of the present article are such that attention will be given mainly to a necessarily brief presentation of some of the more important general pathological processes, with particular reference to man.

General Principles in Pathology.— From what has been said of the scope of pathology it is evident that, as it is a study of the perversion of normal structure and function, there must be in each instance some underlying cause which brings about the disturbance In every case it is found in the last analysis that there has been something which may be regarded as an injury either immediate or remote even to preceding generations, which has started the chain of events leading to the abnormal state. Frequently it is very difficult or impossible to discover the nature of the injury, but this does not in any way affect the principle and in each obscure disease the final discovery of the aetiological factor or cause reveals some injurious agency. In many cases the injury is such as to produce peculiar and perfectly specific changes in the tissue or specific disturbances of function, but in others the result is one that is the common effect of many causes. There are certain ways in which the body responds to injuries by stereotyped mechanisms of a defensive character which act because those are the common forms of response regardless of the nature of the attack, but there are others which are definitely aimed at the neutralization of a particular form of injury and these are specific and come into play only when that special injury occurs.

It is easy to review in broad lines the types of injury, and reflection will show the class into which each special form of injury will fall. Thus there are physical influences which become injurious and in the same way there are chemical injuries. As far as we know the whole race of bacteria act through their chemical effects although some of the larger animal parasites may cause mechanical injuries. We cannot quite place tumors which cause both mechanical and chemical injuries because we do not know anything about the reasons for their growth. Nor are we as yet quite sure about the importance of psychic influences in so far as their ability to cause material injury is concerned. The natural normal growth and development and functioning of the body is to a great extent the result of physical and chemical influences and it is easily understood, therefore, that the withdrawal of some of these influences may produce a diseased condition in a negative way quite as well as the intensification of others in a positive way.

Immutable laws do exist according to which normal growth and nutrition and the functioning of all parts of the body proceed. Of many of these we are only slowly beginning to recognize the existence through their being brought to our attention by being exaggerated or otherwise rendered conspicuous by disease. Such is the recent comprehension of the rules which govern the behavior of the body when rendered immune or when rendered abnormally sensitive.

Restitution to normal depends upon some innate tendency toward a normal form and interrelation of structure. This restitution is carried out by the aid of certain reparatory and compensating growths of tissue which are to some extent influenced by mechanical factors, but which aim to re-establish the balance of tissues and organs and the type form of the body. But this repair and compensation for the loss of tissue could not ordinarily take place were it not for those reactions which have been evolved through ages to protect the body and to pave the way for its restoration to normal. They are inflammation, fever and the development of immunity.

Immediate Effects of Injuries.—The nutrition and metabolism of the tissues are chemical processes. Injuries of the most different kinds may so disturb these processes as to produce changes in the appearance of the cells which have long been recognized as common to many sorts of disease. They may be of the nature of the wasting of the cells, or on the other hand various substances which are ordinarily easily consumed or transferred elsewhere to be used in other chemical reactions may accumulate in or about the cells and become very conspicuous. Many of these rather heterogeneous changes have long been spoken of as degenerations and there is still much controversy as to their true significance. Thus fats of various sorts may accumulate in visible globules in cells in which they do not normally appear. Much of this is undoubtedly due to impairment of the function or even the structure of the cell, but often it is difficult to draw any line between what is normal and what is abnormal in this respect. So, too, the precise nature of the change in such organs as liver and kidneys which become swollen and opaque in some infectious and toxic diseases (cloudy swelling or parenchymatous degeneration) is not yet clear.

The abnormal distribution and disposition of mineral substances such as calcium and iron, or of pigments or crystals of unusual organic compounds, also form part of this theme and indicate in each case some disturbance of the metabolism of these substances.

When the injury to the cell is more profound and sufficient not only to disturb its function and the disposition of extraneous or food materials, but to cause its death, the structural changes quickly become far more evident. The nucleus fades or disintegrates and disappears and the whole protoplasm coagulates into a solid mass through the agency of certain ferments. Other ferments may in time dissolve and remove it, but in the meantime it appears as a hyaline pink staining mass. (Amyloid is a curious translucent substance, of little real importance, but prominent in the minds of pathologists, which resembles in appearance the hyaline material derived from coagulated cells and is deposited in the course of chronic infections in the crevices of many tissues).

Thus the injury which is severe enough to cause the death of a cell allows it when it is bathed in the fluid of the body to become clotted into a homogeneous mass or later to be dissolved by ferments and removed.

Indirect Effects of Injuries.— The process of clotting or coagulation is an interesting and complex one which plays a part not only in the protective closure of injured blood vessels but in the solidification and exclusion from direct contact with the blood of all dead and harmful tissue. The blood clots when it comes in contact with a foreign body or with injured tissue. Thus it may clot in the heart or in the veins even from the passing stream if it flows over an injured part of the lining wall. Such a clot when formed in the streaming blood has a peculiar architecture and is called a thrombus. Portions of such a thrombus or indeed other undissolved substances may become loose in the blood stream and be carried to some narrow pass where they act as plugs (emboli) and by plugging the blood vessels obstruct the circulation to the corresponding tissue. If this obstruction is complete and the tissue deprived of the nourishing blood it dies throughout that area and in time becomes clotted. Such a dead and coagulated area is known as an infarct.

Disturbances of the Circulation.— The blood flows smoothly through all the tissues so long as the heart pumps properly with competent valves to keep the stream aright. But any obstruction, whether it be due to a plug in the blood vessel or a defect in the valve of the heart or a failure of the muscle of the heart, impedes the flow of the blood. Reflection will show that the failure to maintain the flow is as much an obstruction as an actual plug or the compression exerted by a tumor, on the aorta or vena cava. When any such obstruction prevents the access of blood to an organ that organ becomes anæmic, and it prevents the escape of venous blood, the organ becomes congested or hyperæmic. In this sense the term chronic passive congestion explains itself. When the fault is in the heart itself such chronic passive congestion may be general and leads to characteristic changes in the organ. It is one of many causes of œdema or infiltration of the tissue with fluid which has emerged from the veins or lymphatics to lodge in the crevices of the tissues. Other causes of œdema are in large part obscure, but we may mention a type which accompanies inflammation and another which seems due to the retention of salt in the tissues with a corresponding retention of fluid.

Inflammation.—Any injury of the tissues whether physical or chemical may be followed by a prompt reaction on the part of the whole body, most intense in the immediate neighborhood of the injury. This reaction is an elaborate one, evidently the result of evolution and selection, which is essentially protective and aims at the neutralization of the injurious agent by the pouring of the blood with its somewhat specific neutralizing materials and its phagocytic cells upon the injured place. Eventually this is an aid in removing any tissue which is too much injured and in cleaning the site of injury for repair. The reddening and heat which accompany this increased and rapid blood flow in the inflamed area are familiar. The swelling is caused by the œdema of the part.

Fever.— Fever is an accompanying reaction on the part of the whole body which aims to maintain the body temperature at a high point, not especially by excessive heat production, but by controlling the dissipation of heat. It is not entirely clear how this aids the body to overcome infection or other injury, but it is suggested that the high temperature favors the production of neutralizing substances.

Immunity.— The actual production of neutralizing substances, especially constructed by the body to act upon and destroy the injurious chemical agency which has been introduced, is a subject of such extent that it is treated separately in the article on IMMUNITY. It will suffice to say that there are several kinds of immunity, of which not all are due to the production of any specific soluble or circulatory substance. Indeed most of these kinds seem to be due to peculiar natural or acquired properties of the tissue cells themselves. Such are the natural forms of immunity, probably also the immunity from the effects of certain drugs such as morphia and arsenic and the lasting immunity from such diseases as smallpox conferred by one attack. Nevertheless, there is a group of diseases caused by bacteria which produce powerful soluble toxines in which the blood of those who survive is for a time charged with a substance developed during the disease which is able to neutralize the toxin. This is the antitoxin which may be artificially produced in animals and transferred to the blood of man so as to protect from or cure the disease. Examples of this are found in diphtheria and tetanus. In the case of other diseases, such as typhoid fever, vaccination with the bodies of typhoid bacteria confers a definite immunity from attack and has obliterated the disease from modern armies.

Healing and Repair Regeneration.— General mention of healing and repair has been made, pointing out the strong innate tendency toward the return of the injured organ or tissue to the closest possible approximation to the original form and arrangement. There is an immediate healing or patching of the injured place with fibrous tissue, no matter what was there before. This is carried out after the gluing together of the tissue surfaces by a clot of fibrin, and the principal part in the replacement of this temporary adhesive material is taken by blood vessels and connective tissue cells. Thus this form of healing is effected not necessarily by the sort of tissue which is injured, but in all cases by fibrous tissue which in the end figures as a scar. Another even more broadly useful part of the reparatory process is the new formation of enough of the specialized tissue which was injured to make up the normal quota. Thus if a part of the liver is destroyed the rest increases in size and in the number of its cells until the normal amount of liver tissue is once more reached. This form of repair may occur at a point far removed from the site of the injury. It is very well exemplified in cirrhosis of the liver, in chronic nephritis and many other conditions in which repeated injuries destroy the cells of the organ, but life is kept up because other distant cells multiply to replace those which were lost and to maintain the function of the organ as nearly as possible in its normal relations with other organs.

Hypertrophy and Atrophy.— The extent of this regeneration depends to some degree upon the demands which are put upon the organ. Even in the case of uninjured organs an increased demand for functional activity is met by an increase in the number of cells or sometimes an increase in the size of each and thus of the whole organ. When for any reason increased work is demanded of the heart it increases in size and the walls of its chambers become thicker and stronger. Such hypertrophy of the heart is ordinarily the response to an increased pressure or tension in the blood current. Inasmuch as the heart itself is the only source of energy to produce this tension it amounts to saying that the hypertrophy of the heart is due to increased resistance to the force of the heart beat, in overcoming which the heart grows larger and stronger just as does the blacksmith's arm with work. A quite different set of processes lead to the wasting or atrophy of tissues when they are not used or when their nutrition is impaired. Examples are found in the diminution in size of paralyzed extremities or the organs and tissues of the aged.

Mechanical Injuries.— The application of such principles to the explanation of the effects of injuries in disease is quite simple in the case of most mechanical disturbances, although these, too, often draw in their train a long chain of intimately connected happenings. Most common among these secondary results are the effects of the invasion of bacteria in tissues whose resistance is lowered by the injury or into which the bacteria are directly introduced by the wounding instrument. More complicated consequences also occur as when a gall-stone obstructs the bile duct and causes jaundice with a tendency to hemorrhage which makes surgical interference a menace to life.

Chemical Injuries.— Chemical poisoning causes a very great variety of lesions in the tissues and disturbs the functions of the organs in manifold ways, sometimes by killing the cells, sometimes by diverting the materials for their nutrition. See TOXICOLOGY.

Bacterial Infection.—The diseases produced by bacteria form a very important division of pathology and the nature of the bacteria themselves is discussed under bacteriology. For our purpose only pathogenic bacteria need be considered, and of these a few such as the diphtheria bacillus cause disease by producing a powerful soluble poison which is absorbed into the blood and carried throughout the body. Such bacteria really grow outside the body in a sense, inasmuch as they are found in wounds or on mucous surfaces whence they spread their poison.

In case of other bacteria no such strong poisons have been demonstrated in cultures or filtrates from cultures, but it seems that in the body they must produce very strong injurious substances of some sort for they cause the death of cells with which they come into contact, and even the destruction of rather distant cells. These are bacteria which invade the organs and multiply within the body, or even in the blood stream, until great numbers are present. Certain forms such as the streptococcus or staphylococcus may produce such a septicæmia and set up inflammatory reactions following the death of tissue wherever they lodge and form colonies. Puerperal septicæmia, carbuncles, boils, pneumonia, pleurisies and peritonitis are among the effects of these pyogenic organisms.

Pneumonia is ordinarily caused by one or other of the types of pneumococcus and is a disease in which the lung becomes filled with an inflammatory exudate of fibrin and cells formed round the millions of pneumococci which find their way into the bronchi and air cells.

The typhoid bacillus taken in with food or water invades the whole body, but causes characteristic changes in the lymphoid apparatus of the intestine, mesenteric glands and spleen. A great swelling of this tissue is produced by the accumulation of new cells which may undergo necrosis so that in the exposed lymphoid structures of the intestine ulceration ensues.

The tubercle bacillus is distributed in many ways in the body and where it lodges produces commonly small grey nodules of non-vascular tissue rich in cells which tend to become confluent and to undergo necrosis. In other cases in which the resistance is not great the bacilli may cause an acute inflammation with abundant exudate. This inflammation, especially in the lung, is quite as prone to be followed by a necrosis involving tissue as well as exudate, as is the case with the scattered tubercles. Combinations of these processes produce the great destruction of tissue seen in pulmonary phthisis and other tuberculous diseases.

Another widespread disease of great importance, syphilis is caused by the treponema pallida, a thin spiral organism which produces very different changes in the three or four stages which are characteristic of the disease. The primary lesion is an induration of the skin and underlying tissue, the secondary lesions are various eruptions on the skin and mucosae, while the changes in the tertiary stage are in the form of large necrotic nodules (gummata) in bones and internal organs.

Great numbers of other diseases are due to such bacterial invasion, but space forbids any discussion of these.

Animal Parasites.— Another great group of diseases is caused by the invasion of animal parasites usually very low in the scale of animal life. Of these the most important are the protozoan or unicellular organisms which cause malaria, amœbic dysentery and the sleeping sickness of Africa, although new forms are constantly being described. Malaria may be regarded as a type of such infections. The parasite is injected into the blood by the bite of a mosquito, and there goes through a cycle of development ending with division into many young spores, the emergence of which from the red corpuscles is accompanied by a chill. These spores enter other corpuscles and repeat the cycle. The mature forms when sucked out of the blood by another mosquito go through a different cycle in the body of the insect forming spores of another sort which reach the blood of a second human being by the next bite of the mosquito and start once more the human cycle. Similarly a great group of parasitic affection is due to the invasion of worms and occasionally even of insects.

Exanthematic Diseases.— Such diseases as smallpox, measles, scarlet fever, etc., appear to be caused by some parasite different from the bacteria. At present we are ignorant of the nature of the organisms in this whole group of diseases, although it is certain that they present all the appearances of acute infections.

Anæmia and Leukæmia.— Many of the diseases already described as associated with the production of some form of poison are accompanied by a destruction of the red corpuscles of the blood which leaves the body supplied with a pale watery blood and constitutes anæmia. When the causative disease is known we speak of a secondary anæmia. There is, however, a kind of severe anæmia of which the cause is not known, and since it is a progressive and fatal disease it is called pernicious anæmia. Other curious conditions in which the blood is flooded with various leucocytes and other cells in enormous numbers are spoken of as leukæmias. Their nature is quite obscure, but it is known that in them as in the types of anæmia the bone marrow is very active in producing new cells.

Organic Insufficiency.—The partial or complete destruction of such organs as the thyroid, adrenal, pancreas, hypophysis and parathyroid give rise to profound disturbances, the nature of which is even yet but imperfectly known. For example, the destruction of the thyroid is followed by myxœdema, while what appears to be an increase in its activity or at least a perversion results in exophthalmic goitre. So too destruction of the pancreas or of the islands of Langerhans embedded in it is followed by diabetes, while equally characteristic diseases ensue when decreased activity or over-action of the other organs of internal secretion arises. The fact that some of these diseases (notably myxœdema and cretinism, which are due to destruction or maldevelopment of the thyroid) may be cured or greatly ameliorated by the administration of extracts of the corresponding gland promises much for the future when the relations of those which are as yet imperfectly studied become known.

Mental Diseases.— Derangements of the functions of the brain are naturally the result of all sorts of diffuse and localized destructive or injurious processes which are as likely to affect that tissue as any other. Some bacterial infections produce inflammations of the substance and covering of the brain and spinal cord (meningitis), while others acting more slowly cause not an acute febrile illness, but a chronic mental disease (syphilis causing general paresis). There are, however, many forms of insanity which crowd our asylums, but in which as yet we have not only failed to discover the cause, but are even unable to recognize any structural changes in the brain. In addition to these of which some appear to be due to infection or intoxication, there are many cases of defective mentality due to hereditary maldevelopment of the brain or to some defect of internal secretion.

Congenital Malformations; Monsters.— Great difficulty is met in the attempt to explain the origin of congenital malformations. That they are the result of peculiarities of the germ-cells or of disturbances in development is certain, but the nature of these disturbances is obscure. Experimental embryology, it is true, has shed some light upon them in showing that some may be produced by the action of injurious physical and chemical agencies during the incubation of the egg; and the evidences of pressure, amniotic and placental adhesions, etc., in the malformed fœtuses themselves explain others; but as to the origin of the greater number knowledge is wanting. In many instances the same malformation occurs in several members of the same family and seems hereditary.

When only one individual is concerned there may be all grades of defective or superfluous development from such familiar conditions as hare-lip to those in which the medullary groove has failed to close (spina bifida), or in which the tissue which should form the brain has remained spread over a deformed spine so that only a thin membrane is there to represent the brain (acrania). Such extreme malformations as the latter are incompatible with life after birth.

When two individuals are concerned they may be practically perfect but united, as in the case of the Siamese twins, at some point in the body; or with a more marked malformation they become more or less completely merged in one another. Sometimes one is relatively perfect while another very incomplete individual or part of one is fused into the body at some point and projects, as the so-called parasitic monster. A still more rudimentary mass, containing many of the tissues of a second individual, may be completely included within the body of the first and form there a sort of tumor called a teratoma. The simplest form of such tumors is the so-called dermoid cyst, which occurs most frequently in the ovary.

Tumors.— These are masses of atypical tissue which appear at some point or points in the body and proceed with an unlimited growth without serving any useful function, but rather to the injury of the organism. Much obscurity prevails as to their nature and origin, various theories ascribing their growth to disturbance of the equilibrium between tissues, to continued injury or irritation of the tissues, to congenital misplacement of embryonal cells which remain latent and begin to grow later, perhaps not until advanced age, and finally to protozoan parasites. During recent years many authors have described structures in the cells of cancerous tumors which they have regarded as parasites and the cause of the tumor growth, but as yet it cannot be said that there is convincing evidence as to the validity of any of these supposed parasites, and investigators are practically as much in the dark as ever with regard to the causation of the growth.

Tumors are usually composed of cells which, although atypical in form or arrangement, so closely resemble those normally present in the body — generally those in the immediate neighborhood or continuous with the primary growth — that they are regarded as developed from these analogous cells and are classified on this apparent histogenetic basis, their names being usually a combination of that of the tissue with the termination — *oma.* Thus a fibroma is a tumor derived from and composed of fibrous tissue; an epithelioma, one composed of epithelial tissue; a lipoma, one composed of fatty tissue, etc. Sarcoma and carcinoma, however, are so called from the resemblance of the former to flesh, and the latter from its fancied resemblance to a crab.

Tumors grow sometimes by the continual new formation of cells within themselves producing circumscribed, rounded masses which push aside the surrounding tissue (benign tumors). Others rapidly invade by means of sprouts of cells the crevices of the surrounding tissue so that that tissue is destroyed, and on encountering lymphatic or blood vessels they penetrate their walls and distribute the cells into the blood or lymph stream so that new cell-colonies are formed in the organ in which these floating emboli lodge (malignant tumor). Such secondary tumor-masses are spoken of as metastatic nodules, and are always due to the transportation of cells. They may be very numerous and much more bulky than the primary growth.

Benign tumors may spring from the various forms of connective tissue, fat, fibrous tissue, bone, etc.; from epithelium, neuroglia and so on. They produce disturbances only by their bulk and the pressure they exert upon surrounding tissues. Malignant tumors may similarly arise from tissues of the connective type, from epithelium or from endothelium. They injure the organism not only by their bulk, but also by their destructive invasion of the surrounding tissues, and apparently likewise bv the elaboration of a poison which aids in producing the cachexia so frequently seen in these cases. The most important of the malignant tumors are the sarcomata, which resemble in structure embryonic connective tissue, and the cancers or carcinomata, which spring from epithelium, commonly in such situations as the skin, the lining of the stomach or intestine, the breast and the uterus. Carcinomata are composed of communicating masses or strands of epithelial cells imbedded in a frame-work of connective tissue.

The great loss of life caused by the various kinds of tumors renders their study a matter of extreme importance, and the discovery of their causes and of trustworthy methods for their prevention and cure, to which many investigators are devoting their attention, constitutes one of the chief aims of modern medicine.

Bibliography.— Consult Garrison, 'History of Medicine.' Textbooks of pathology in English are by Hamiliton, Green, Delafield and Prudden, Stengel and Fox, Mallory, Councilman Adami, MacCallum, Wells, Castellani and Chalmers, Manson (tropical diseases). References to the literature will be found in many of these books and there are many journals devoted to the subject such as *Journal of Experimental Medicine, Journal of Medical Research, Journal of Infectious Diseases, Journal of Pathology and Bacteriology*, etc. Among the works on bacteriology in relation to disease may be mentioned those of Muir and Ritchie, Abbott, Park and Williams, Kendall, Hiss and Zinsser, Marshall.

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PATIALA, pŭt-ē-ä'lä, or **PUTTIALA**, Sikh native state in the Punjab, lying in the Cis-Sutlej group, with the exception of a small part in the hills near Simla. Two railway lines cross the state and the Sirhind Canal irrigates a large part of it. The rajahs have long been faithful to England, showing their loyalty in 1857, and in 1898, when the rajah, who died in 1900, personally took the field in the Tirah campaign against the Afghans. The state has valuable deposits of copper, lead, slate and marble; its area is 5,951 square miles, and population about 1,500,000, of which about one-third are Sikhs, one-fourth Mohammedans, and a small proportion Jains. The capital city is Patiala, on the Rajpura-Bhatinda Railroad; pop. 70,000.

PATIENCE, or BUNTHORNE'S BRIDE, a comic opera in two acts; words by W. S. Gilbert; music by Sir Arthur Sullivan: produced at the Opéra Comique, London, 23 April 1881, and in New York at the Standard Theatre, 23 Sept. 1881. The play is a satire on the «æsthetic movement» of the early '80s, a burlesque on the exaggerated and ridiculous form that movement developed among persons who, without natural taste of their own, tried to assume the attitudes and mimic the appearance of their intellectual superiors. The «high priest» of this absurd cult, Oscar Wilde, and his school of imitators, had for some time been satirized in the pages of *Punch* by Du Maurier and Burnand, so that the antics and the jargon of imaginary «æsthetic» circles had become familiar as household words. The witty ridicule of Gilbert, set to the tuneful melodies of Sullivan, was mainly responsible for the early disappearance of that style of «æstheticism.» Patience, a dairymaid, gives the title and supplies the contrast of a healthy ignorance of æsthetic idealities. The scene is laid in a country of whimsical fancy; the plot is love, and develops around two poets and a host of «lovesick maidens.»

PATINA, *in the fine arts,* the fine green rust with which ancient bronzes and copper coins and medals become covered by lying in particular soils, which, like varnish, is at once preservative and ornamental. An artificial patina is produced by the forgers of antiquities. The name is also applied to a bowl of metal or earthenware. See PATEN.

PATKUL, pät'kool, **Johann Reinhold**, Livonian soldier: b. Livonia, Russia, about 1660; d. near Posen, Prussia, 10 Oct. 1707. He was of a noble family, received a military education and entered the army, but withdrew to enter upon a diplomatic career. He involved himself in intrigues which resulted in his being summoned to Stockholm, where, finding himself precondemned, he fled to Courland, and was branded as a traitor by the Swedish government. He entered the service of Augustus II, elector of Saxony and king of Poland, as privy councilor, and was largely responsible for the alliance of Russia and Denmark with Augustus against Sweden. He was accused later of treasonable relations with Austria and Sweden, and was arrested by Augustus. The Peace of Altranstadt, which Augustus was compelled to sign in 1706, stipulated the surrender of Patkul, who was tried by court-martial on the homeward journey of the Swedish troops, broken alive on the wheel, decapitated and drawn and quartered at a monastery near Posen. Consult Buchholz, 'Beiträge zur Lebensgeschichte J. R. Patkulus' (1893).

PATMORE, păt'mōr, **Coventry Kearsey Dighton**, English poet: b. Woodford, Essex, 23 July 1823; d. Lymington, Sussex, 26 Nov. 1896. He was the son of Peter George Patmore, a writer of some note in his day, and published his first volume of poems in 1844, narrative pieces of little interest in themselves, but displaying no little descriptive power and poetic insight. From 1846 to 1868 he was an assistant in the British Museum, and in 1854 published the first part of his most widely known poem, 'The Angel in the House.' It was entitled 'The Betrothal,' and was followed in 1858 by 'The Espousal.' It proved popular both in England and this country, was parodied and occasionally scoffed at; but many of its admirers as well as its critics failed to detect the mystical significance its author intended it to have. Patmore was a mystic through much of his career, and in this work he was typifying heavenly love by earthly affection. It was succeeded by 'Faithful Forever' (1860), a poem of disappointed love, and 'The Victories of Love,' a poem of bereavement (1862). Later volumes of verse include 'Amelia, Tamerton Church Tower' (1878), and 'The Unknown Eros and Other Odes,' in which latter, mingled with much of mysticism, will be found at least two of the most touching poems in the English language, 'Toys' and 'It was not Like Your Great and Gracious Ways.' Patmore was also the author of several volumes of prose, 'Principles of Art' (1889); 'Religio Poetæ' (1893); and 'Rod, Root and Flower' (1895). About 1868 he became a Roman Catholic, and some of his latest verse betrays his change of thought in this respect. At his best Patmore takes high rank as a poet and in spite of many trivialities his verse is more often melodious than otherwise. Consult Champneys, 'Memoirs and Correspondence of Coventry Patmore' (1900); Claudel, Paul, 'Coventry Patmore' (in Etudes franciscaines, Vol. III, Paris 1914); Gosse, E. W., 'Coventry Patmore' (New York 1905).

PATMOS, Turkish island in the Ægean Sea, off the coast of Anatolia, now called PATMO, PATIMO, or SAN GIOVANNI DI PATMO, and belonging to the vilayet of Jezairi-Bahri-Zefid. It measures 10 miles from north to south and contains about 15 square miles of rather rocky, unfertile soil. It once did a flourishing business with Ephesus, but at the beginning of the Christian era was a desert, used as a place of sequestration. Here Saint John was exiled and wrote the Apocalypse. At the close of the 11th century a monastery was built here in honor of Saint John, which had a very valuable collection of ecclesiastical manuscripts. Patmos was seized by Italy in 1912 during the Turco-Italian War. Pop. over 4,000, nearly all of which are Greeks. Consult Guérin, 'Description de l'Ile de Patmos et de l'Ile de Samos' (1856).

PATNA, păt'nạ, more correctly **PATTANA** («the town»), India, (1) a city of Bengal, capital of a district of the same name and of the division of Bihar, on the right bank of the Ganges, 397 miles by rail northwest from Calcutta. The city proper is one and a half mile in length by about half that extent in breadth; but with its large suburbs stretches nine miles along the Ganges, and presents externally a striking appearance from the river, many large and handsome flat-roofed houses with carved balustrades being interspersed with temples, mosques and tombs, Saracenic gateways of red stone, large granaries, wide ghats, or stairs from the water and bastions projecting into the stream — the whole backed by a height on the land side. The adjacent cantonments at Dinapur are handsome and well laid out. Patna is a stronghold of Mohammedanism, and the chief seat of the opium trade. A large business is done in oil-seeds, rice, saltpeter, wheat, indigo, sugar and provisions. Among the manufactures are table-linens, wax candles, lacquered wares and bird cages; brocades, embroidery, pottery, toys, fireworks, gold and silver wire and leaf, glassware, boots and shoes, carpets and furniture. Patna has been identified with the ancient Pataliputra — Lotus City, which was probably founded in the 5th century B.C. Megasthenes, a Greek historian, who visited it about 300 B.C., describes it under the name Palibothra, and a Chinese pilgrim of the 7th century A.D. has also left an account of it. The native name Azimabad was given to it in honor of Azim, grandson of Aurungzebe, who was at one time its governor. The English, French and Danes had factories here formerly, but eventually the British traders drove out their rivals. In 1763 disputes about transit duties arose between the East India Company's servants and the native government. The result of the war which followed was the expulsion of the native forces and the district coming into possession of the British. Patna was the headquarters of the Wahabi or Mussulman conspiracy of 1864. Pop. about 140,000. (2) The district has an area of 2,076 square miles. Pop. about 1,625,000. (3) The division has an area of 23,675 square miles. Pop. over 16,000,000. (4) A native Rajput state, feudatory to Bengal; area, 2,399 square miles. Pop. about 300,000.

PATON, păt'n, SIR **Joseph Noel,** English painter: b. Dunfermline, Scotland, 13 Dec. 1821; d. Edinburgh, 26 Dec. 1901. He became first known to the public by his water-color painting of 'The Combat between Bothwell and Balfour' (1838); and soon afterward grew into popularity as an illustrator of books and magazines. In 1843 he attended the art school of the Royal Academy in London, and exhibited in 1844 his well-known picture 'Ruth Gleaning.' The following year he exhibited 'Rachel Weeping for Her Children,' in 1846 'Oberon and Titania,' and 'Christ Bearing the Cross.' He painted for Queen Victoria 'The Queen at the Deathbed of the Prince Consort.' He was more or less of a Pre-Raphaelite, but his drawing, while graceful, is sometimes weak, and his color lacking in harmonious arrangement. His skill as a sculptor and his learning as an archæologist were almost equal to his pictorial skill, and he wrote graceful verse and published 'Poems by a Painter' (1861), and 'Spindrift' (1867). In the latter year he was knighted. He made the drawing for the great glass windows which Andrew Carnegie had restored in 1884 in Dunfermline.

PATON, Lewis Bayles, Congregational clergyman and educator: b. New York City, 27 June 1864. He graduated at New York University in 1884 (A.M. 1893); at Princeton Theological Seminary in 1890; studied at the University of Berlin 1890–92; received the degree of Ph.D. at the University of Marburg 1897; and D.D. at New York University 1906. He was ordained to the Presbyterian ministry in 1890, and transferred to the Congregational ministry in 1892. He was instructor 1892–93, and associate professor 1893–1900 of Old Testament exegesis and criticism at Hartford Theological

Seminary, and since then Nettleton professor. He was director (1903–04) of the American School of Oriental Study and Research in Palestine at Jerusalem; and is honorary secretary for the United States of the Palestine Exploration Fund. He edited 'Recent Christian Progress' (1909); contributed to journals, encyclopedias and dictionaries of archæology and religion, and published 'Early History of Syria and Palestine: Jerusalem in Bible Times' (1908); 'Esther (International Critical Commentary), The Early Religion of Israel' (1909).

PATON, William Agnew, American author: b. New York, 20 April 1848. He was publisher of the New York *World* (1877–81); connected with *National Republican* (1881–85); United States Commissioner (1883); business manager of *Scribner's Magazine* (1885–87). He has written 'Down the Islands: a Voyage to the Caribbees' (1887); 'Picturesque Sicily' (1897); 'The First Landfall of Columbus' (1907); 'Home Rule Ballads' (1907).

PATRAS, pä-träs', or **PATRÆ,** pä'trē, a seaport of the northwestern Peloponnesus or Morea, on the Gulf of Patras, which leads into the Gulf of Corinth. The port is ill-protected and owes its importance to its position; olive oil, wines, raisins and sheepskins are exported, and there are mills, foundries and cotton and silk factories. The city is essentially modern and lies some distance from the old town, which had a great commerce in the 5th century B.C., and again in the 1st when it was rebuilt by Augustus and became famed for its cloth manufactures and as the site of the Oriental worship of Aphrodite. During the Middle Ages it was the chief commercial city of the Peloponnesus. Now the city is a station of the Austrian Lloyds and the Mediterranean and New York Steamship Company connects it with New York city. It has several consulates, among them one of the United States; pop. about 40,000.

PATRIARCHAL SYSTEM (Greek, *patēr,* father, *archē,* rule). The extreme paternal form of the family in which the authority of the husband and father in the family has become so supreme that he is practically owner of all persons and property of the family group, the wife and children being reduced if not to the position of property at least to the position of subject persons. A second characteristic of the Patriarchal System is that the family organization usually included not only all persons related by descent through common male ancestors but also all persons received into the family by the ceremony of adoption and even all slaves and dependents. The patriarchal family, therefore, frequently consisted of hundreds of individuals, and was a little political unit, the head of which was the eldest living male.

Classical pictures of the patriarchal system may be found in the description of the lives of the Hebrew patriarchs in the Old Testament. Practically all European and Asiatic peoples were in this stage of social development when they first appear in history. For this reason, Sir Henry Maine thought that the patriarchal family was the original type of family in the human species. (See FAMILY, HISTORY OF). This view is contradicted, however, by the fact that the maternal family and the maternal system of relationship are much more widely prevalent among all uncivilized peoples. Anthropologists and sociologists now universally agree that the patriarchal system is a relatively late development in the history of the family. It reached the acme of its development in early historic times among the Hebrews, Greeks, Romans, Hindus and Chinese.

The causes of the development of the patriarchal system were complex. Wife capture and wife purchase, together with the growth of the idea of property and persons, in the period of barbarism were doubtless contributing causes. But the decisive factor in creating the patriarchal family was pastoral industry. The keeping of flocks and herds of domesticated animals necessitated the separation of families through their wandering over long stretches to secure pasturage, and at the same time the employment of a large amount of male labor. Under such conditions the husband gained great power over his wife, as she was separated from her kindred, and as the owner of the flocks and herds which constituted almost the sole property of the group, his authority gradually became supreme in all matters.

But the fully developed patriarchal system received its stamp from that primitive religion which we know as ancestor worship. This religion, deifying the departed male ancestors, tended to reinforce the authority of the house father, because he was the oldest living ancestor, and the representative, so to speak, of the gods upon earth. Thus arose the *patria potestas* of the Roman father, that is, the power of life and death over all members of the family group. This power, however, could not well be exercised arbitrarily, as the house father was necessarily controlled by religious scruples and traditions. Disobedience to the house father was, however, disobedience to the divine ancestors, and hence was usually severely punished.

Among the Hebrews and some other peoples we find the patriarchal system without ancestor worship; but in such cases the evidence seems to show that ancestor worship once existed, but had been largely obliterated through the adoption of a higher religion.

The patriarchal system is now chiefly of interest because of its effects upon later history. Inasmuch as all the chief historical peoples of Europe and Asia have passed through a patriarchal stage of development, the history of these peoples can scarcely be understood without a knowledge of the patriarchal system. Not only have our historical ideas regarding the family, but also those regarding property, government and religion, been influenced by the patriarchal system. Patriarchal ideas, it has often been pointed out, have been impediments to progress along these several lines; but at the same time it must be acknowledged that no high degree of social organization, as Spencer insisted, would have been possible if there had not been a patriarchal stage of development.

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PATRIARCHS, the three fathers of the Hebrew race, Abraham, Isaac and Jacob. The patriarchal government prevails in a state of society in which the people are not yet organized into a nation, but consist of independent tribes, clans or families under the government of the head of the family. Later the title patriarch was assumed by the presidents of the sanhedrim, which exercised authority over the Jews of Syria and Persia after the fall of Jerusalem. The patriarchate of Tiberias for the Western Jews lasted till 415, that of Babylon for the Eastern Jews till 1038. From them the term was borrowed by the Christians, who applied it to the bishops of Rome, Constantinople, Alexandria, Antioch and Jerusalem. These patriarchs consecrated and supervised the archbishops and bishops within their jurisdictions. While with the patriarchate of Rome was united the primacy of the Roman see throughout the world (see PAPACY), the four heads of the Eastern Church preserved the title of patriarch. The Armenian, Abyssinian, Jacobite and Maronite churches have patriarchs of their own. The Patriarch of Constantinople is the primate of the Greek Church in the Turkish Empire, and bears the title of œcumenical. (See RUSSIAN RELIGION). The authority of the Patriarch of Moscow which extended over the Russian Church was superseded, during the reign of Peter the Great, by the holy synod. Consult Bingham, 'Origines' II; Morin, 'De Patriacharum origine'; Neale, 'History of the Eastern Church'; Riddle, 'Christian Antiquities.'

PATRIARCHS MILITANT. See ODD FELLOW.

PATRICIANS (Latin, *patricius*, from *pater*, father), the name given by the Romans to the members and descendants by blood or adoption of the original *gentes* of which the Roman people was composed, until the plebeians became a distinct class of citizens. The other sections of the Roman population, the clients and slaves, did not belong to the *populus Romanus.* During the first centuries of the republic there was an almost uninterrupted struggle between the patricians and plebeians, in which the former fought hard to retain their exclusive rights, but which ended in the establishment of the political equality of the two orders; only a few insignificant offices remained the exclusive privilege of the patricians. The formation of a new aristocracy, founded on wealth and on the holding of the offices of consul, prætor and curule ædile, made the patricians of still less account. When the seat of government was removed to Constantinople, Constantine the Great, desirous of restoring the ancient Roman ranks, instituted a new patrician dignity, which was a mere personal title, and which could be acquired only by high birth and distinguished merits. Under the Carlovingians and the succeeding emperors the title of patrician denoted an exalted rank, and was connected also with the government of Rome and its provinces, and the support of the Papal See. Charlemagne assumed the title of a Roman patrician before he was declared emperor, and Henry IV, as such, deposed Pope Gregory VII. In modern times a few noble families in the imperial cities were called patricians, because they were especially entitled to certain high offices. In some Italian cities the title of patrician is still used to denote a member of the nobility. Consult Botsford, G. W., 'The Roman Assemblies' (New York 1909); Bryce, 'Holy Roman Empire' (New York 1911); Burg, J. B., 'Later Roman Empire' (London 1899); Foltz, 'Beitrage zur Geschichte des Patriciats in den deutschen Städten' (Marburg 1899). See ROME; PLEBEIANS.

PATRICK, Saint, the apostle and patron saint of Ireland. The date of his birth has variously been placed at from 373 to 389; and his death from 461 to 493. One tradition says he was born at Kilpatric, another at Dumbarton, Scotland, but the place of his birth, Benneventa, has never been definitely settled. Some authorities are inclined to place it somewhere on the southwest coast of Britain, near the Irish Channel; others as stoutly maintain it was in the north, while others place it on the Severn River. His Celtic name was Sucat, to which, as he seems to have been brought up as a Christian, the name of Patricius was probably added. His father, Calpurnius, a native Briton, seems to have been a man of some influence in the community, a decurion, or member of the municipal council and apparently a friend of the Romans. His grandfather, Potitus, was a presbyter. When 16 years of age Patrick was taken prisoner by some Irish who made a raid on western Britain, and was carried off into slavery in Ireland «near to the western sea.» After six years, he succeeded in making his escape to the Continent, probably to western France, an uninhabited country through which he and those with him traveled 38 days suffering many hardships, before they came to an inhabited part of the country. There Patrick finally found refuge in the Monastery of Lérins, on an island off the west coast of Provence, where he seems to have remained for some years, after which he returned home to Britain. There he claims to have had a vision of himself going as a victorious apostle of Christianity to the Irish. This he regarded as a divine call; and he went back to Autissiodorum (Auxterre) in Gaul, where after a period of study and preparation, he was ordained bishop together with two other prospective missionaries for Ireland. This work of preparation in Gaul seems to have covered 14 years, for it was not until 432 that he became bishop of Ireland on the death or retirement of the Irish bishop Palladius. He at once took possession of his new office, filled with enthusiasm for a work to which he seems to have long looked forward. It is probable that the Christian communities in Ireland were, at this time, confined to the south and west of the island; and the task before the new bishop was not only to minister to these and to hold them together, but also to gain the goodwill of the various local rulers, or as they styled themselves, kings. His knowledge of Irish and Latin was a very valuable asset in this work; and his experience of six years in the country had given him an insight into the character of the people that he could probably not have learned as well in any other way. It is probable that he landed at the mouth of the river Vartry in Wicklow at a place called Inverdea; and from there he went into east Ulster (Ulidia); and began his missionary work on the southwest side of Strangford

Lough, in a wooden barn given him for religious purposes, by an Irish convert known as Dichu, a chief and a man of importance in that part of the island. True to his mission, he seems not only to have preached, but also to have done his best to interest in Christianity the rulers of the various districts, over whom was a head ruler or king called Loigaire. Through the influence of Patrick, Fedilmid, brother of Loigaire, declared himself a Christian and gave his support to Patrick and presented him with an estate at Trim, to be used to found and support a church. Through his influence the bishop seems to have gained the protection of Loigaire, though the latter never deserted the faith of his ancestors, and thus to have been enabled to gain converts and to found churches in various parts of the island, though he seems to have given more of his attention to the north than to the south of Ireland. Many legends and traditions, most of them of a miraculous character, are connected with this period of his work and with various parts of the island. It seems that he visited Rome (441–443), saw Pope Leo, got his enthusiastic approval of the Irish work and brought back with him noted relics from the papal city.

On his return to Ireland in 444 he made Armagh the ecclesiastical capital of the island. The land on which the church here was built had been given him by King Daire of Oriel. In his later years he was bitterly criticized and he finally resigned his office as bishop and retired probably to Saul in Dalardia where he died, it would seem according to the best authority, in 461. He has left two important documents; one of which is his 'Confessions,' which is a sort of autobiography, written toward the close of his life, and the other, the "Letter to Coroticus," the British king of Strathclyde. In this latter document Patrick urges the Christian subjects to have nothing whatever to do with the king until he repairs certain very grave offenses against the Christians in Ireland.

Saint Patrick seems to have been a man of very strong will power and very considerable executive ability. He must have been much of a diplomat to have achieved the success he did in the midst of warring factions at a period when the power of druidism was very strong in Ireland. Whatever may be doubtful about his life, there can be no doubt that he was a great organizer, and that his enthusiasm and his faith in his work inspired him to treat with kings and princes, as though they had been put there for his purposes of the spread of the Christian faith. He was a man of tireless action and enthusiasm in his work; and we are told that he founded 360 churches, baptized with his own hand 12,000 people, and ordained a great many priests. Though, at the conclusion of his work, Ireland was still more pagan than Catholic, yet he had dealt a death blow to the religion of the druids, which was shortly to disappear before the onward march of the ideas set into motion by him. He influenced strongly the Irish mind, and Celtic imagination has surrounded him with picturesque legends. He banished the snakes and toads out of Ireland; he performed the most astounding miracles in his contests with the druidical priests; he confounded his enemies by bringing down darkness upon them; and many equally wonderful things tradition credits him with doing. His name is connected with scores of localities throughout Ireland, and generally there is some local story connected therewith. At his death so great was the glory that there was no night for 12 days.

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PATRICK, Saint, Order of. See ORDERS AND DECORATIONS.

PATRICK, Albert T., American lawyer: b. Texas, 19th century. He was engaged in practice when charged with inspiring the murder of William Marsh Rice, an aged millionaire, on 24 Sept. 1900. Patrick was convicted 26 March 1902 and was sentenced to be electrocuted, but secured appeals which delayed the execution of the sentence. His sentence was commuted to life imprisonment by Governor Higgins in 1906 and he was pardoned by Governor Dix in 1912. The motive for the crime was supposed to be Patrick's inheritance of the Rice fortune through a bogus will. It was said that the conduct of the case during the 12 years cost Patrick and his friends $162,000.

PATRICK, Mary Mills, American college president: b. Canterbury, N. H., 10 March 1850. She was educated at Lyons College, Iowa, the State University of Iowa and at the universities of Heidelberg, Zurich, Leipzig, Berlin and Berne. She became president of the American College for Girls at Constantinople in 1890. She was a member of the Pyschological Congresses at Munich in 1896 and at Paris in 1900; and of the Philosophical Congresses at Paris, 1900, and at Bologne in 1911. Author of 'Armenian Translation of Text-Book of Physiology' (1876); 'Sextus Empiricus and Greek Skepticism' (1899); 'Sappho and the Island of Lesbos' (1912), etc.

PATRICK, Simon, English Anglican bishop: b. Gainsborough, Lincolnshire, England, 8 Sept. 1626; d. Ely, Cambridgeshire, 31 May 1707. He was educated at Queens College, Cambridge, became rector at Covent Garden in 1662, in 1678 was appointed Dean of Peterborough, became Bishop of Chichester in 1689, and of Ely in 1691. He defended the Reformation, during the reign of James I, though in early life he had written against the Nonconformists. His views changed, however, later and he favored the Nonconformists in many ways, and he did his best to lessen the misunderstanding and ill-will existing between them and the Anglicans. A man of vast learning and a wise ecclesiastic, he was the author of numerous devotional treatises, some of which are still read. A complete edition of his works (9 vols.) edited by Alexander Taylor and including Patrick's 'Autobiography' was published in 1858. Among his published works are 'Conformist and Non-Conformist'; 'Mensa Mystica'; 'The Heart's Ease'; 'The Parable of the Pilgrim'; 'The Christian Sacrifice'; 'The Dignity of the Christian Priesthood'; 'Paraphrases upon the Books of the Old Testament' (10 vols., from Genesis to Solomon, 1695–1710). Consult Chamberlayne, T., 'Memoir' (in 'The Parable of the Pilgrim' (London 1839).

PATRIMONIUM PETRI, păt-rī-mō'-nī-ŭm pē'trī, or **PATRIMONIUM ECCLESIÆ**, the territory of the papal government during the time when the temporal power of the pope was a reality. In a narrower sense it denotes the territory nearest Rome which became the property of the papal curia in the 8th century. Dante, however, attributes the original territorial possessions of the Roman bishopric to the gift of Constantine.

PATRIOFELIS, a creodont animal found fossil in the Middle Eocene formations of Wyoming, which was about the size of a lion, but was of aquatic, or semi-aquatic, habits, and preyed much if not altogether upon the turtles which abounded in the shallow waters of that region during Eocene times. It is regarded by some writers as a possible ancestor of the seals. See CREODONTA.

PATRIOTIC SOCIETIES, in the United States are those organizations which aim to foster love of country through the celebration of important events in American history, and by keeping alive memories of the heroic sacrifices of Colonial and other wars and the preservation and restoration of historic sites and monuments. Among the societies devoted to the colonial period are: Society of Mayflower Descendants, Society of Colonial Wars, Order of the Founders and Patriots of America, Society of Colonial Dames of America, National Society of Colonial Dames, Society of Daughters and Patriots of America, Holland Society, New England Society, American Flag Association, Society of the Ark and The Dove, Order of Washington, Order of Pequot and King Philip, National Society of Scions of Colonial Cavaliers.

In commemoration of the Revolutionary War there are numerous organizations including the Society of the Cincinnati, Sons of Revolutionary Sires, Society of the Sons of the American Revolution, Naval Order of the United States, Military Order of Foreign Wars, Saint Nicholas Society of New York and others. Subsequent societies were the General Society of the War of 1812, Veteran Corps of Artillery, American Order of the Louisiana, the Aztec Club (q.v.), Association of Mexican Veterans, Society of the Descendants of the Signers of the Declaration of Independence, the Society of the Dames of the Revolution, the Society of the Daughters of the American Revolution, Society of the Children of the American Revolution, Society of the United States, Daughters of 1812, Daughters of the Republic of Texas.

As the outcome of the Civil War the following were among the patriotic societies organized: Military order of the Loyal Legion, Grand Army of the Republic with its adjunct — the Woman's Relief Corps, Union Society of the Civil War, Union Veteran Legion, Sons of Veterans, Union Society of the Civil War, Society of the Army of the Cumberland, Society of the Army of the Potomac, Society of the Army of Tennessee, Eleventh Army Corps Association, Second Army Corps Association, Thirteenth Army Corps Association, Union Society of the Civil War, Military Order of the Medal of Honor, National Association of Naval Veterans (q.v.), Medal of Honor Legion (q.v.), United Confederate Veterans, United Daughters of the Confederacy, United Sons of Confederate Veterans.

Other patriotic societies include the Order of Indian Wars of the United States, Society of Veterans of Indian Wars, Order of the Serpent, United Spanish War Veterans, Society of the Army of Santiago de Cuba, Military and Naval Society of Porto Rican Expedition, Rough Riders Associaton, Society of the Caribbean, Military Order of the Carabao, National Society of the Army of the Philippines, Military Order of the Dragon, Military Order of Foreign Wars, Mount Vernon Ladies' Association, the George Washington Memorial Association, Ladies' Hermitage Association, National Society of Patriotic Women of America, Landmarks Club of Los Angeles, Colorado Cliff Dwellers' Association, Thomas Jefferson Memorial Association and the American Scenic and Historic Preservation Society. Under the heading of patriotic societies may also be included the numerous State and local historical societies. See HISTORICAL ASSOCIATION, AMERICAN.

PATRIOTS' DAY, in Massachusetts, the anniversary of the double battle of Concord and Lexington, 19 April 1775. The day was first observed in 1894.

PATRIPASSIANS. See SABELLIUS.

PATRISTIC THEOLOGY, that section of Christian literature bearing particularly upon ethics and doctrine which is contained in the writings of early fathers of the Church, a term generally confined to writers of the first five or six centuries of the Christian era. They are generally classed as Patristic Fathers or Apostolic Fathers, who were nearest to and partly contemporary with the Apostles, namely Pseudo-Barnabas, Clement of Rome, Ignatius, Pseudo-Ignatius, Papias, Hermas and Polycarp; the ante-Nicene Fathers, who lived between 167 and the Nicene Council 325, and the post-Nicene Fathers. The Eastern and Western Church have each a group of authors who are recognized as fathers par excellence. Those of the Eastern Church are Athanasius, Basil, Chrysostom, Gregory Nazianzen, Cyril of Alexandria and John of Damascus, while those of the West are Jerome, Ambrose, Augustine, Gregory of Rome, Leo the Great and Hilary of Poitiers — to whom are often added Bernaud of Clairvaux, Thomas Aquinas and Bonaventura. Consult Migne, J. P., 'Patrologiæ Cursus Completus' (221 Vols., 1844–65); Pusey, E. B., 'Library of the Fathers' (47 vols. 1838–80); Lightfoot, J. B., 'Apostolic Fathers (5 vols., London

1889-90); Farrar, F. W., ‘Lives of the Fathers’ (2 vols., Edinburgh 1889); Krüger, G., ‘History of Early Christian Literature’ (Gillett's trans., New York 1897).

PATROCLUS, pa-trō'klŭs, the friend and brother in arms of the Greek champion Achilles, was the son of Menœtius, one of the Argonauts. On accidentally killing Clysonymus, in his early life in a game of dice at Opus, he saved himself by flight, and reached Thessaly where he was kindly received by Peleus, who educated him as the companion of his own son. He accompanied Achilles to Troy, and remained, like him, inactive, when the anger of Achilles kept him from taking a part in the war. At length Achilles permitted Patroclus to go forth to battle, where he was arrayed in the armor of Achilles. Apollo stunned him and rendered him defenseless, and he was slain by Euphorbus and Hector. The Greeks recovered his body, which they interred with the highest marks of honor, and established solemn funeral games to his memory. Achilles then avenged his friend by challenging Hector and slaying him in single combat.

PATROL, a military term applied to the walking or marching round of a guard to watch and observe what passes, and to secure the peace and safety of a camp or other place. In the European War the word has been applied also to scouting parties sent out between the lines to gain information or to prepare for an attack in force. Also men on guard who go the rounds in the night; a detachment whose duty it is to guard; or a policeman whose duty it is to patrol a certain district or beat for the protection of property and to preserve the peace. Such policemen are frequently called patrolmen. In early American history the word patrol was applied to a military system adopted by the parishes of most of the Southern colonies, notably South Carolina. The patrol was a sort of police for the parish and was designed especially to prevent and subdue insurrections among the slaves. In South Carolina the patrol was established by law in 1704. The patrollers furnished their own pistols and horses. They rode from plantation to plantation and arrested all slaves who could not show passes from their owners. This system soon became general through the South, and continued under various forms for many years.

PATROL, Insurance. See INSURANCE PATROL.

PATRON (from the Latin «Patronus» through the French «patron»). The word was directly connected with «pater,» father, and in its signification and use undoubtedly dates back to patriarchal days. Among the Romans, a name denoting a patrician who had plebeians under his immediate protection, and whose interests he supported by his authority and influence. When Rome had conquered many nations, noble Romans were sometimes the patrons of whole cities and provinces, and such patronage even descended by inheritance in some families. The Marcelli were patrons of the Sicilians because Claudius Marcellus had succeeded in conquering Sicily. Patron was also the title of every advocate who represented the interest of another, his client. In later times the term patron was applied to every protector or influential promoter of the interests of others; hence the saints who were believed to watch over the interests of particular persons, places or trades were called patron saints. The patron became the guardian of a clients' interests and upheld these interests in the law courts. Patron and client were under a legal obligation never to accuse one another, down to before the Christan era. Even to-day throughout Latin countries the patron is a person of importance. In Spanish America the name is given to the head of a family or business by his employees; and the word is used in much the same sense as «boss» in English. One who provides food for a feast or entertainment is also designated the patron of the occasion. When a new business is opened with a dinner or reunion to celebrate the occasion the giver of the feast is known as the «patron»; when a child is baptized there is a patron for the occasion. The person who freed his slaves in Roman days generally retained toward them the relationship of patron or protector, that is the old patriarchal relation of a father to his family; and this relationship was recognized in early Roman law — as the patronus pleaded for them in court or on special occasions, the word in Latin came to have the special meaning of lawyer. In an ecclesiastical sense, a patron has long had the meaning of one who has the right to present a «living» or other preferment to a clergyman. In Spanish countries this idea is carried further, and a captain of a ship or the landlord of a rented property or the keeper of an inn or hotel is familiarly called the «patron.»

PATRON SAINT, the canonized saint who is sometimes credited with watching over, protecting or interceding for certain persons, places, trades or institutions. Thus Saint George is commonly called the patron saint of England, Saint Denys of France and so on. In the Middle Ages every trade had its patron saint. Saint Clair was the patron of lamplighters; Saint Cloud of nailers; Saint Blanc or Blanchard of laundresses; Saint Peter of fishermen; and Saint Dunstan of goldsmiths. The patron of an individual is generally the saint by whose name he was baptized. In most Latin countries a person celebrates not only his birthday but each of his saint's days. It often happens that he may be required to celebrate one certain saint's day several times in the year, as that of Saint John or that of Saint Joseph. So it is common to add to such a name a specific to determine which John or Joseph it is. Thus we have «Juan de Dios» (John of God) in Spanish as a very common baptismal name; and in French John the Baptist is so common that in some parts the French peasants are designated «Baptist.» The same thing happens with Jesus, which is a common baptismal name in Latin Catholic countries; and the curious combination Jesus Mary is frequently met with in men's names. This limits the name to one person, Jesus the son of Mary.

PATRONAGE, the right vested in a person, official, or political party, of appointment to offices and positions, the award of contracts, the disposition of emoluments, pensions, etc. Except in special cases, the right of appointment to office was vested by the Constitution of the United States in the President, his selections to be confirmed by the Senate, and up to the time of the Civil War, the President maintained actual as well as nominal control of appointments. But during and after that period the patronage at the disposal of the national government increased at such a rate that the political manipulation of offices became exceedingly complex. Practical dictation to certain offices was gradually acquired by the senators who by courtesy secured the control of appointments, each in his own State, although in form, the initiative and the responsibility remains with the President.

In the field of State and local government, cities furnish the greatest display of the misuse of patronage as appointments are numerous and elective officers few. Except in the matter of building contracts, supplies, etc., education, fortunately, has usually been considered outside the domain of politics, and teachers have been chosen primarily with a view to fitness for their positions. In the combination of Federal and local patronage, the number of voters who get, or expect to get employment in case of a party victory is so large that it tends to destroy true party balance. The need of controlling this power has led several States to enact civil service laws with the object of taking most of the appointive offices out of politics.

Experience shows that instead of being the support of the party system, patronage tends rather to its destruction. There are never spoils enough to «go round»; bitter factions grow up and their selfish strife disrupts the party. Patronage is in fact a concealed form of bribery; the giving of office or contracts as rewards for party service works insidious corruption of political morality. A large proportion of voters regard offices as perquisites of the party, as gifts bestowed upon the faithful, rather than as positions of public trust, and as Horace Bushnell has strikingly observed, «such a system would corrupt a nation of angels.»

Ecclesiastical patronage is the right vested in a church body or a layman to appoint a properly qualified person to a vacant church appointment. Marked by much contention and various abuses during the Middle Ages, the history of ecclesiastical patronage goes far back into the centuries and still exists, to some extent, in the Protestant churches of Europe. In the United States, ecclesiastical patronage is vested usually in the official body of laymen supporting a church, with the exception of Catholic churches where it is vested in the diocesan bishop on the general principles of the canons of the third and fourth Lateran councils as decreed by the plenary councils of Baltimore. See CHURCH GOVERNMENT.

PATRONS OF HUSBANDRY. See GRANGERS.

PATRONYMIC (a name taken from one's father), a term which designates a person in reference to some of his ancestors, either immediate or remote. In Sanskrit, Greek and Latin patronymics are very common. In Sanskrit they have 13 recognized terminations. In Greek the suffixes were *idēs, iōns, iadēs, eides,* etc., for the masculine, and *ias, is, as,* etc., for the feminine. Achilles is called by Homer both Pelides and Æacides, Peleus being his father's name and Æacus that of his grandfather. The Latins borrowed their patronymic terminations *ides* and *is* from the Greek. Among modern languages the Russian, Danish, German and English have adopted patronymic terminations, the suffixes being respectively *vitch, sen, sohn* or *son,* and *son.* In Portuguese, Italian and Spanish patronymics are very common. The Norman *Fitz,* the Welsh *Ap,* the Irish *O* and the Highland *Mac* are prefixed to the paternal name, which thus becomes a patronymic. Patronymics may be derived from the name of father, mother, grandfather or remote ancestor. The latter is the case with most modern patronymics. In Russian patronymics have companions, a matronymic, as for example «Pavlovna,» the «daughter of Paul,» while the name «Pavlovitch» means the «son of Paul.» In Spanish Christian or family names regularly become patronymics by the addition of «ez.» Thus González, a very common patronymic, is the «Son of Gonzalo.» Consult Bradley, C. W., 'Patronomatology' (Baltimore 1842); 'Die Patronymica im Alt-Indischen' (Göttingen 1903). See NAMES.

PATROONS (Dutch, «protector» or «patron»), a popular name applied in colonial days to a special class of settlers in the New Netherlands. In 1629 the Dutch West India Company, in order to effect a permanent agricultural colonization of New Netherlands, granted a charter of «privileges and exemptions» to any members of the company who would within four years plant a colony of 50 anywhere in New Netherlands, except on Manhattan Island. These wealthy grantees were called Patroons, and were privileged to rule their colonies in absolute feudal style, the colonists being bound to them for a certain number of years. Each patroon was entitled to have as his absolute property 16 miles of land along any navigable river, or eight on each shore, and so far inland as convenient. The proprietors were empowered to hold civil and criminal courts, to appoint magistrates and other local officers, and in general, to punish offenders against the law. The settlers were exempt from taxes for 10 years, but they had to pay certain rentals. Slavery was introduced into these settlements, trade and commerce were greatly restricted and manufacturing was prohibited. This system was soon found to be disadvantageous, since it tended to debar the less wealthy class of individual colonists. In 1640 the charter was modified and extended to any good citizen of the Netherlands. The system gave New York, during the colonial period, a sort of landed aristocracy. The first and largest of numerous patroonships was Rensselaerswyck, a property which remained in the Rensselaer family until the middle of the 19th century. The charter of 1640 limited the period of settlement to three years, removed the prohibition against manufactures and limited the extent of land grants to four miles along the coast or rivers and eight miles into the interior. Under the English régime some of the regulations of the system were changed, and after 1775 the patroons, or "Lords of the Manor," became merely landed proprietors. The system occasioned some trouble between landlord and tenant, which culminated in 1839 in the anti-rent agitation (q.v.). Consult Alexander, D. S., 'Political History of the State of New York' (3 vols., New York 1906–09); O'Callaghan, E. B., 'History of New Netherlands' (2 vols., New York 1846).

PATTAN, pa̧-tän′ (incorrectly **PATAN, PATN, PUTTUN,** or **PATHAN:** Hindustani, «city»), a common city name in eastern India. The two most important towns of this name are Pattan in Baroda, on the Sarasvati, in the province of Gujarat, Bombay presidency, with a large fraction of its population composed of Jains, who have 108 temples in this sacred city. Swords, lances and knives are made here, as well as a very beautiful sort of pottery. Pop. about 40,000. Pattan in Nepal, on the south bank of Baghmati, two miles southeast of Katmandu, has many beautiful ruined palaces and temples and a population of about 30,000. It was formerly the capital city of Nepal.

PATTEE, păt-tē′, **Fred Lewis,** American educator: b. Bristol, N. H., 22 March 1863. He was graduated A.B., Dartmouth, 1888; M.L., Dartmouth, 1915; Litt.D., Lebanon Valley College, 1915. He studied also at the universities of Göttingen, Edinburgh and Marburg and has been head of the department of English, Pennsylvania State College, since 1894. He is the author of ‘A History of American Literature’ (1896); ‘The Foundations of English Literature’ (1900); ‘The Elements of Religious Pedagogy’ (1909); ‘A History of American Literature since 1870’ (1915); three novels: ‘Mary Garvin’ (1902); ‘The House of the Black Ring’ (1905); ‘The Breaking Point’ (1911); and edited the ‘Poetical Works of Philip Freneau’ (3 vols., 1902–07).

PATTEN, George Washington, American soldier and poet: b. Newport, R. I., 25 Dec. 1808; d. Houlton, Me., 28 April 1882. He was graduated from Brown University in 1825, from West Point in 1830, served in the Seminole wars and in the war with Mexico, and was brevetted major for gallantry at Cerro Gordo where he lost his hand. He served on various military commissions during the Civil War until 1864 when he was retired with the rank of lieutenant-colonel. As a poet he earned the title «poet-laureate of the army.» Among his lyrics are the well-known ‘Seminole's Reply’; ‘Joys that We've Tasted’; ‘Episode of the Mexican War.’ He also published ‘Artillery Drill’ (1861); ‘Cavalry Drill and Saber Exercise’ (1863); ‘Voices of the Border,’ poems (1867).

PATTEN, James A., American grain speculator: b. Freeland Corners, Ill., 8 May 1852. He was employed in the State Grain Inspection Department at Chicago in 1874–78 and afterward engaged in business as a grain commission merchant. He was mayor of Evanston, Ill., 1901–05. He attracted worldwide attention and much hostile criticism by his attempt in 1909 to corner the wheat market, and as late as 1911 his appearance at his house's Liverpool headquarters placed him in danger of being mobbed.

PATTEN, Simon Nelson, American economist and sociologist: b. Sandwich, Ill., 1 May 1852. He was educated at Northwestern University, Illinois, and the University of Halle, Germany, taking the degree of Ph.D. at Halle in 1878. On his return to the United States he taught in the public schools, and in 1888 became professor of political economy at the University of Pennsylvania. He has contributed to sociological journals and written ‘Premises of Political Economy’ (1885); ‘Economic Basis of Protection’ (1890); ‘Theory of Dynamic Economics’ (1892); ‘Theory of Social Forces’ (1896); ‘Development of English Thought’ (1899); ‘Theory of Prosperity’ (1902); ‘Heredity and Social Progress’ (1903); ‘New Basis of Civilization’ (1907); ‘Product and Climax’ (1909); ‘Social Basis of Religion’ (1911); ‘Reconstruction of Economic Theory’ (1912). As a writer he is suggestive, brilliant and original, but some of his conclusions are regarded as unusual and are not accepted by sociologists; he has, however, advanced some theories of acknowledged value, particularly in his study of the dynamic forces of society, his discussion of value and price, and of the relation of distribution to consumption, etc.

PATTEN, William, American zoologist: b. Watertown, Mass., 15 March 1861. He was graduated at the Lawrence Scientific School, Harvard, in 1883, and afterward studied at Leipzig. He was assistant in Lake Laboratory, Milwaukee, in 1886–89; professor of biology at the University of North Dakota in 1889–93; and has been professor of zoology at Dartmouth since 1893. Author of numerous scientific papers in American and German periodicals, and of ‘The Evolution of the Vertebrates and Their Kin’ (1912).

PATTERN, *in decorative art,* a unit of design used as a model for more or less repetition. It is also used to signify the whole body of ornament covering a given surface. Thus a paper hanging for walls or a piece of textile fabric or an inlaid floor is decorated according to a pattern, or with a pattern, which will be laid out according to a general design including many minor parts. The colored plate gives many patterns of different epochs intended to be carried out in many different materials from which, indeed, the examples have been taken. Thus Figs. 1, 2, 3 and 5 are from Chinese and Japanese enameling on metal. Fig. 4 is a Japanese painted pattern, but the same pattern is carried out in enameled inlay and by piercing a thin board and the like. Figs. 6, 7 and 8 are from Indian and Persian manuscripts, the decorative accompaniment of the lettering, and very similar patterns are found in Oriental glazed tiles. Fig. 9 is from an Indian lacquered box; for the Indian work of this kind, though immeasurably inferior to the Japanese in finish and perfection of make, has often beautiful patterns applied to it. Fig. 10 is a Persian Niello, that is to say, an inlay of black upon a ground of white metal; the ground in this case being mainly cut away so that the black insertion covers most of the field. Fig. 11 is the corner of a Persian carpet; and this composition of conventional flowers should be compared with Fig. 6, that the reader may see this illustration of the wonderful skill of the Persians in such design. The Persians have always been the most able composers of flower patterns and leaf patterns in which natural forms are not closely followed, but artistically conventionalized. Figs. 12 and 13 are from Persian enameled pottery, tiles and the like, and here again the power of this race over floriated design is seen. Fig. 14 is from a French inlay of wood, light upon dark, of the 17th century, and Fig. 15 is a later piece of work of the same character, though here the veining of the wood is allowed to affect the general composition of the pattern.

Figs. 16 and 21 are pieces of French embroidery of the 17th and 18th centuries, the patterns being wrought with a needle upon the black and buff backgrounds. Fig. 17 is a painted cartouche, perhaps intended for an heraldic escutcheon, though the bearings have not been put in. Fig. 18 is a wall decoration in color from the Chateau of Versailles. Fig. 19 is a piece of inlaid marble work of the 17th century. Fig. 20 is taken from a piece of Rouen ware, the most decorative variety of French faïence and the earliest to reach artistic perfection, dating from the 17th century. Fig. 22 is from a gilded and embossed leather wall hanging, and Fig. 23 from an embroidered wall hanging, each of the 17th century and probably of French origin, though the leather hangings of Spain are the more celebrated. Fig. 24 is from a piece of French porcelain of the 18th century, not from the royal manufactory of Sèvres, but from one of the private manufactories of the time in which beautiful work was done. Figs. 25, 26 and 27 are textile fabrics of the 17th and 18th centuries. Such pieces were made for furniture covering and for curtains, but very similar patterns were woven on a small scale and in heavy and solid silk for ladies' wear. Finally, Fig. 28 is a pilaster or stile of the wood-work in a drawing-room, painted in delicate flower patterns directly upon the wood.

RUSSELL STURGIS.

PATTERSON, Carlile Pollock, American scientist and superintendent of United States Coast Survey: b. Shieldsboro, Miss., 24 Aug. 1816; d. Washington, D. C., 15 Aug. 1881. He was a son of Daniel Tod Patterson (q.v.), and entered the navy as midshipman in 1830. He served with the Mediterranean squadron until 1835, when he went to Georgetown University to study civil engineering. He was graduated in 1838 and was appointed to the Coast Survey. He afterward served for a time at sea, attained rank as lieutenant in 1841, and in 1845 returned to the Coast Survey and was placed in command of a hydrographic party in the Gulf of Mexico. He retired from the navy in 1850, and became captain of the Pacific mail steamer *Oregon*. In 1861 he returned to the Coast Survey, of which he became superintendent in 1874. The work was extended to a general geodetic survey under his supervision.

PATTERSON, Daniel Tod, American naval officer: b. on Long Island, N. Y., 6 March 1786; d. Washington, D. C., 15 April 1839. He entered the navy as a midshipman in 1800, was attached to the frigate *Philadelphia* under Captain Bainbridge, and was captured when that vessel was overhauled by a flotilla of Tripolitan gunboats after striking a reef in 1803. He remained a prisoner until 1805, and in 1807 received the rank of lieutenant, becoming master-commandant in 1813. He commanded the United States naval forces at New Orleans in 1814 and greatly assisted General Jackson in the defense of the city, receiving the thanks of Congress for his services. He captured the pirate Lafitte (q.v.) and destroyed his defenses on the island of Barataria. In 1826-28 he commanded the *Constitution*, was navy commissioner in 1828-32, commanded the squadron in the Mediterranean in 1832-36, and was then transferred to the command of the navy yard at Washington.

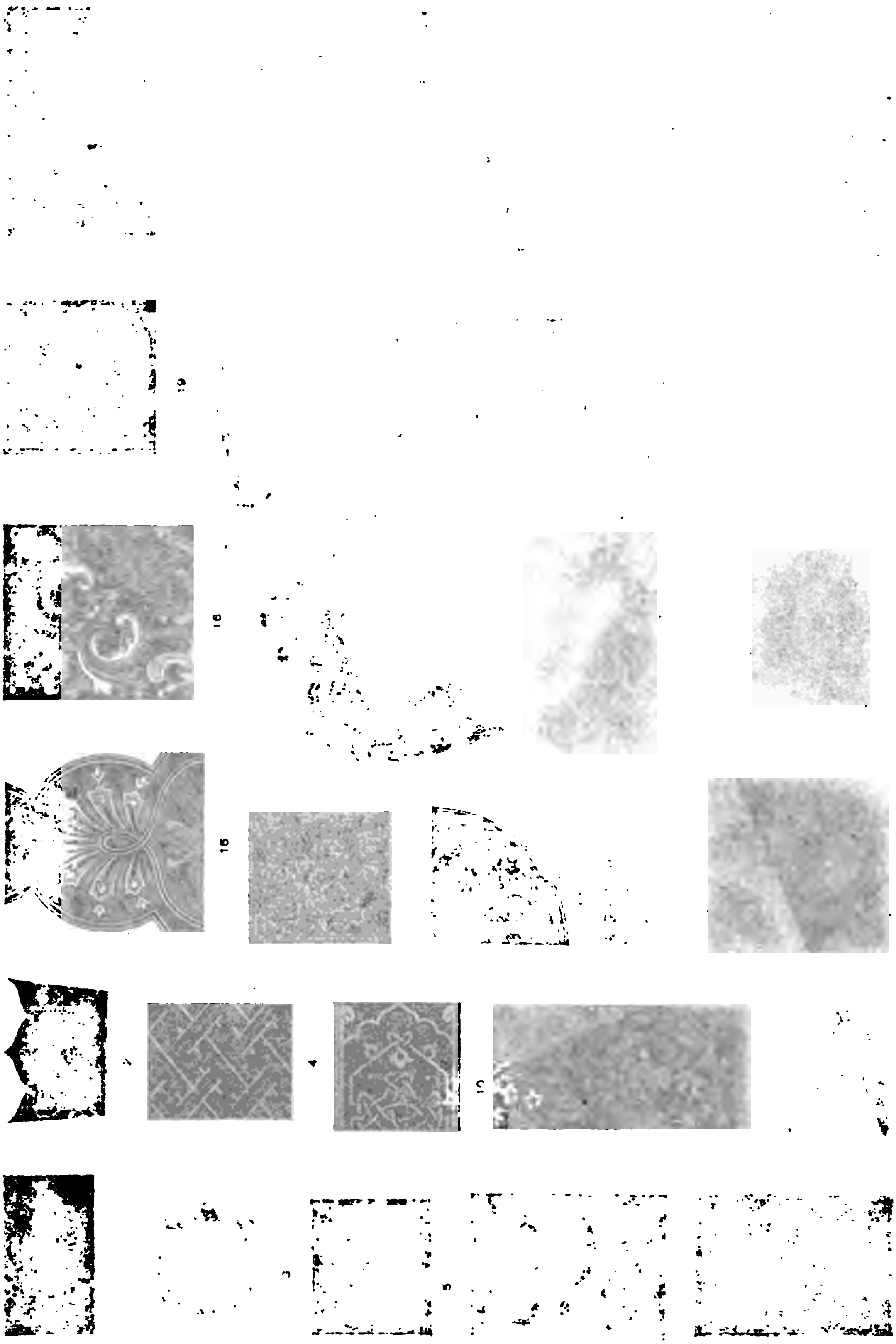
PATTERSON-BONAPARTE, Elizabeth, an American woman who became the wife of Jerome Bonaparte and played a part in the modern history of France. See BONAPARTES OF BALTIMORE.

PATTERSON, James Colebrooke, Canadian lawyer and statesman: b. Armagh, Ireland, 1839. He went to Canada in 1857 and became a barrister in 1876, engaging in practice at Windsor. He was a member of the Canadian House of Commons in 1874-95, and in 1891-95 he was Secretary of State and Minister of Militia and Defense. In 1895-1900 he was lieutenant-governor of Manitoba and Keewatin.

PATTERSON, Joseph, American banker: b. near Norristown, Pa., 25 Sept. 1808; d. Philadelphia, Pa., 25 Sept. 1887. He became a banker and during the Civil War, through his influence, the bankers of the country made a loan of $50,000,000 in gold to Secretary Chase, at the famous conference in New York, and $100,000,000 more in the year following. Secretary Chase constantly sought his advice on the financial policy of the administration. He was twice tendered the office of comptroller of the United States treasury which he declined as he did also the offer of the post of assistant-treasurer at Philadelphia. He was president of the Philadelphia Clearing-House Association from 1869 until his death.

PATTERSON, Robert, American soldier and educator: b. near Hillsborough, County Down, Ireland, 30 May 1743; d. Philadelphia, Pa., 22 July 1824. He came to America in 1768 and settled in Pennsylvania, where he engaged in teaching, and in 1774 was principal of the academy at Wilmington, Del. He volunteered in the Federal army at the outbreak of the American Revolution, and rose to the rank of brigade-major. In 1779 he was appointed professor of mathematics in the University of Pennsylvania, in which office he remained for 35 years, acting as vice-provost in 1810-13. In 1799 he was chosen president of the select council of Philadelphia, and in 1805 was appointed director of the mint by President Jefferson. He published 'The Newtonian System' (1808); a treatise on 'Arithmetic' (1819); edited various works on mathematics and physics.

PATTERSON, Robert, American pioneer: b. Pennsylvania, 1753; d. near Dayton, Ohio, 5 Aug. 1827. He removed to Kentucky in 1775 and assisted in the construction of the fort at Royal Spring (now Georgetown), in defense of which he afterward fought bravely. In 1776 he was one of seven men who made the daring expedition to Fort Pitt in quest of ammunition, receiving on the return trip a severe wound from a skirmish with the Indians in which all the party were either killed or wounded. He fought under Daniel Boone at the battle of Lower Blue Lick, being second in command; was colonel in the Miami expedition of 1782, and served under Logan in his expedition against the Shawnees in 1786. He built the first house in Lexington, Ky., in 1779, owned one-third of the city of Cincinnati, Ohio, when laid out (1788), and founded Dayton, Ohio (1804). Consult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[illegible] Ame- [illegible] attained [illegible] In 1845 re- [illegible] the Gulf [illegible] the navy in 1850, [illegible] Pacific coast [illegible] the Coast S[illegible] of which he became superintendent in [illegible] The work [illegible] extended to a general [illegible] service under his supervision.

PATTERSON, Daniel Todd, American [illegible] on Long Island, N. Y., [illegible] d. Washington, D. C., 15 April [illegible] navy as a midshipman in 1800 [illegible] attached to the frigate *Philadelphia* under Captain Bainbridge, and was captured when the vessel was overhauled by a fleet of Tripoli [illegible] after striking a reef in 1803. He remained a prisoner until 1805, and in 1807 received the rank of lieutenant, becoming master commandant in 1813. He commanded the United States naval forces at New Orleans in 1814 and greatly assisted General Jackson in the defense of the city, receiving the thanks of Congress for his services. He captured the pirate Lafitte (q.v.) and destroyed his defenses on the island of Barataria. In [illegible] he commanded the *Constitution*, was [illegible] commissioner in 1828-32, commanded the [illegible] in the Mediterranean in 1832-36, and

[illegible] James Cole [illegible] Secretary Chase [illegible] New York [illegible] year following [illegible] Secretary [illegible] comptroller of the [illegible] which he declined as he [illegible] president of the [illegible] House Association from [illegible]

PATTERSON, Robert, American soldier [illegible] near Hillsborough, County [illegible] Ireland, 30 May 1743; d. Philadelphia, [illegible] 22 July [illegible] He came to America in 1768 [illegible] in Pennsylvania, where he engaged in teaching, and in 1774 was principal of the academy at Wilmington, Del. He volunteered in the Federal army at the outbreak of the American Revolution and rose to the rank of brigade major. In 1779 he was appointed professor of mathematics in the University of Pennsylvania, in which office he remained for 35 years, acting as vice provost in 1810-13. In 1799 he was elected president of the select council of Philadelphia, and in 1805 was appointed director of the mint by President Jefferson. He published 'The Newtonian System' (1808); a treatise on 'Arithmetic' (1819); edited various works on mathematics and physics.

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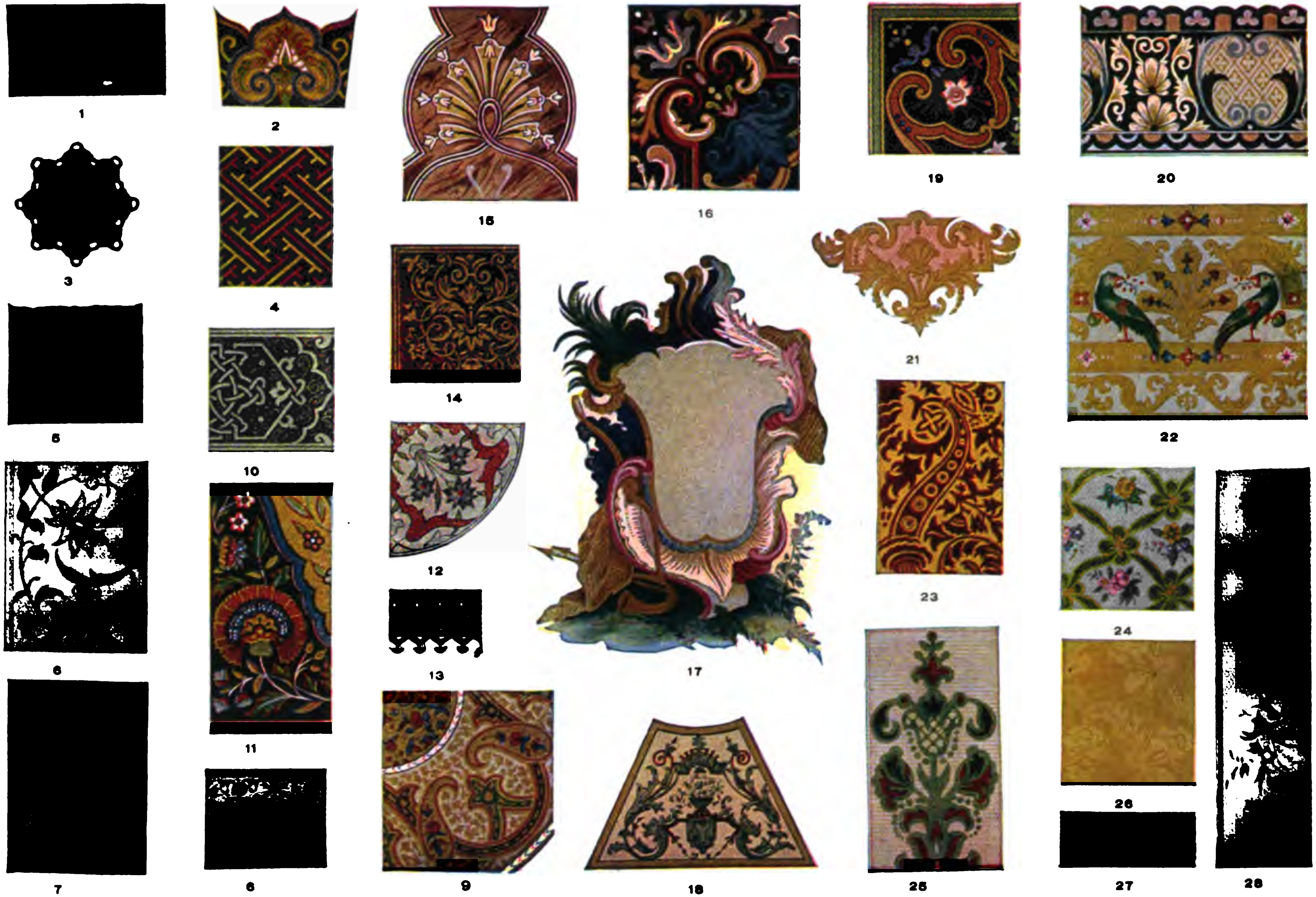

European and Asiatic Designs of the 17th and 18th Centuries

Patterson, J. H., 'Concerning the Forefathers' (1903).

PATTERSON, Robert, American soldier: b. Cappagh, County Tyrone, Ireland, 12 Jan. 1792; d. Philadelphia, Pa., 7 Aug. 1881. He came to America when very young with his parents who settled in Philadelphia. He served in the War of 1812, afterward became a prominent merchant of Philadelphia, and was one of the "five Colonel Pattersons" who nominated Jackson for the Presidency. He organized, in President Jackson's honor, the great civic parade held in Philadelphia in 1833, and in the Mexican War served with distinction. He had already been commissioned major-general of volunteers in 1846, and in the latter war he commanded a division at Cerro Gordo, and directed the cavalry pursuit of the retreating Mexicans, backed up by infantry; and he finally occupied Julapa. At the outbreak of the Civil War he was mustered into service as major-general of volunteers and placed in command of the Department of Washington, where he rendered excellent service in training the raw recruits. He was retired in July 1861. In 1865 he published 'A Narrative of the Campaign in the Valley of the Shenandoah' in explanation of his conduct of affairs, which received much attention and went far toward clearing away the censure to which he had been subjected for his conduct in that campaign.

PATTERSON, Robert Mayne, American Presbyterian clergyman: b. Philadelphia, 17 July 1832; d. 1912. He was official reporter of the United States Senate (1850–55), and was graduated from Princeton Theological Seminary in 1859. He held Presbyterian pastorates in Pennsylvania, and edited *The Presbyterian* (1870–80) and *The Presbyterian Journal* (1880–93). He was a member of 13 general assemblies of the Presbyterian Church; and was author of measures consolidating the synods and enlarging their powers (1880). He was also a member of the Pan-Presbyterian Councils held at London (1875); Philadelphia (1880); and Belfast (1884). Among his works are 'What is our Duty' (1863); 'Character of Abraham Lincoln' (1864); 'Great Valley Presbyterian Church' (1869); 'Revival Councils' (1871); 'Presbyterianism in Philadelphia' (1873); 'The Apostolic Church' (1874); 'Our National Religion' (1876); 'Pre-Millenialism' (1877); 'Elijah the Favored Man' (1880); 'Isaiah and the Higher Critics' (1889); William Blackwood' (1894); 'American Presbyterianism' (1896).

PATTERSON, Robert Wilson, American journalist, editor and publisher: b. Chicago, Ill., 30 Nov. 1850; d. 3 April 1910. He was graduated at Williams College in 1871. He became a reporter on the Chicago *Times* after the great fire, and in 1873 became assistant night editor on the Chicago *Tribune,* subsequently acting as Washington correspondent, editorial writer, managing editor and succeeding Joseph Medill as editor-in-chief of the publication, as well as being president of the company.

PATTERSON, Thomas MacDonald, American lawyer, editor and politician: b. Carlow County, Ireland, 4 Nov. 1839; d. Denver, Colo., 23 July 1917. His family emigrated to America in 1849, and he was sent to Asbury College and later to Wabash College. Admitted to the bar, he set up a practice at Denver, where he was also for many years editor-in-chief of the Rocky Mountain *News* and the Denver *Times.* He was city attorney for Denver in 1874; last territorial delegate from Colorado to the 44th Congress (1875–77); a member of the 45th Congress (1877–79) and member of the Democratic National Conventions of 1876, 1888 and 1892. In 1888 he was also Democratic candidate for governor and a delegate to the Populist National Conventions of 1896 and 1900. From 1901–07 he was United States senator, and was again nominated for governor in 1914.

PATTERSON, La., town in Saint Mary Parish, on the Atchafalaya River, 87 miles southwest of New Orleans, on the Southern Pacific Railroad. Lumber and sugar constitute the chief interests of the town. There are modern waterworks, a high school and a hospital. Pop. 2,998.

PATTESON, păt'ẹ-sŏn, **John Coleridge,** English missionary and martyr: b. London, 1 April 1827; d. island of Nukapu, Melanesia, 20 Sept. 1871. He was educated at Eton and Oxford, was elected Fellow of Merton in 1852 and in 1853 was appointed curate of Alfington, Devonshire. In 1855 he sailed with Bishop Selwyn to New Zealand, and the next 16 years were spent in missionary labors in the Melanesian and other South Sea islands. He was consecrated bishop of Melanesia in 1861. He was greatly beloved by the Melanesians, whom he protected to his utmost against the white kidnappers of the Pacific. He was killed by the natives of Nukapu, one of the Santa Cruz group, in revenge, it is supposed, for relatives carried away by the white slavers. He is said to have spoken over 20 languages and dialects. He made translations from the Bible into the Mota language. Consult Yonge, C. M., 'Life of John Coleridge Patteson' (1874); Awdry, Frances, 'The Story of a Fellow Soldier' (1875).

PATTI, păt'ē, **Adelina Maria** (originally Adela Juana Maria), Italian singer: b. Madrid, Spain, 19 Feb. 1843. The daughter of Italian opera singers, she was brought up in New York, where she was trained by Strakosch, who married one of her elder sisters, Amelia. Her wonderful voice, when she was only in her seventh year, saved her family from poverty. It was nearly ruined by overwork, however, and she only retired from the concert stage in time to save it. On 24 Nov. 1859 she made her début in opera in New York as Lucia, and on 14 May 1861 in London as Amina, going in the next year to Paris, where she stayed until 1870, singing at the same time in Italian opera in London and Madrid. Her success everywhere was tremendous, partly because of her personal grace and charm, but mostly due to her pure style and her clear, pure-toned voice, which has wonderful range. The Italian operas in which she most frequently sang were 'Sonnambula,' 'Lucia di Lammermoor,' 'Il Barbiere di Siviglia,' 'Don Pasquale,' 'La Traviata,' 'Rigoletto,' 'Don Giovanni,' 'Il Trovatore,' 'I Puritani' and 'Ernani.' She occasionally sang Wagnerian songs in concert. In November and December 1903 she made an American concert tour, which was a great financial success, and which showed that her vocal powers were only slightly impaired. She married 1868 the Marquis of Caux, equerry to Napoleon III, left him in 1877, was divorced in 1885, and married in June 1886 the tenor Niccolini, after whose death, 18 Jan. 1898, she married in 1899 Baron Cederstrom, with whom she lives at Craig-y-Nos, in Wales.

PATTI DE MUNCK, Carlotta, Italian concert singer, sister of Adelina Patti (q.v.): b. Florence, 1840; d. Paris, 27 June 1889. She was first trained as a pianist, but devoted herself to vocal music, and in 1861 appeared in concert in New York; her lameness prevented her from staying on the operatic stage. She sang in London in 1863, made several tours in Europe and America, and 3 Sept. 1879 married Ernest de Munck, a violoncellist. Her execution was excellent, and her voice a remarkably high and flexible soprano.

PATTI, Sicily, town in the province of Messina, on the north coast of the island, 42 miles by rail southwest of Messina. There is a cathedral dating from 1300, in which is the tomb of Adelasia, mother of Count Robert of Sicily. There are sandstone quarries in the neighborhood and the town has a shipping trade in olive oil, flour and fish. Industries include silk mills and potteries. Pop. commune 10,535; town 5,604.

PATTISON, păt'ĭ-sŏn, **Dorothy Wyndlow,** best known as «SISTER DORA,» English nurse: b. Haukswell, near Richmond, Yorkshire, 16 Jan. 1832; d. Walsall, Staffordshire, 24 Dec. 1878. She was a sister of Mark Pattison (q.v.). In 1864 she entered a Church of England Sisterhood of the Good Samaritan at Coatham, adopting the name of «Sister Dora.» The next year she was sent as nurse to a cottage hospital at Walsall. She at once endeavored to render herself a good surgical nurse, and from 1867 to 1877 was in sole charge of a new hospital at Walsall, built in 1867. She resigned in February 1877, in order to take charge of the municipal epidemic hospital at Walsall. She shrank from no labors, however difficult or repulsive, and her natural qualifications as a nurse were reinforced by the skill she acquired in surgery. She was greatly beloved by the poorer classes among whom she labored, and in her memory a window was placed in the Walsall parish church and a statue of her erected in Walsall in October 1886. Consult Lonsdale, Margaret, 'Sister Dora' (1880); Ridsdale, Elen, 'Sister Dora' (1880).

PATTISON, James William, American painter and author: b. Boston, Mass., 14 June 1844; d. 29 May 1915. He enlisted in the United States army in 1863 and rose to the rank of sergeant before his discharge in 1865. He received his art education under James M. Hart, R. S. Gifford and George Inness in New York, and under Albert Flamm in Düsseldorf, and Luigi Chialivia in Paris. He painted a wide number of subjects including figures, domestic animals, landscapes and marines. He exhibited at the Paris Salon in 1879–81 and for many years at the National Academy and American Water Color Society in New York and the Pennsylvania Academy of Fine Arts and the Art Institute of Chicago, as well as in other exhibitions throughout the United States. He received a medal at the Saint Louis Exposition in 1904. He was director of the School of Fine Arts, Jacksonville, Ill., in 1884–96; and from 1896 was faculty lecturer on the collections at the Art Institute of Chicago. He also edited the *Fine Arts Journal,* Chicago, from 1910. Author of 'Painting in the Seventeenth and Eighteenth Centuries' (1901); 'Painters Since Leonardo' (1904).

PATTISON, Mark, English scholar and clergyman: b. Hornby, Yorkshire, 10 Oct. 1813; d. Harrowgate, Yorkshire, 30 July 1884. He was educated at Oxford, and in 1839 became a Fellow of Lincoln College, Oxford. In 1843 he took priest's orders in the English Church and was appointed a tutor in Lincoln College the same year. He was at this time a follower of Newman, but presently drifted away from Tractarianism and became in his later years an extremely liberal member of the Anglican communion. In 1861 he became rector of Lincoln College and engaged actively in the work of university reform, and under him his college developed its resources and came into prominence in the university. He was a most thorough scholar, but often caustic in speech and always impatient of anything like pretense. He spent considerable time in Germany in literary research and was curator of the Bodleian Library and the Taylor Institutions. He had in view for a long time the writing of a history of learning, but of this only fragments were written. To the famous book 'Essays and Reviews' he contributed 'Tendencies of Religious Thought in England 1688–1750,' and he was the author of 'Suggestions on Academical Organization' (1868); a 'Life of Isaac Casaubon' (1875), his principal work; 'Life of John Milton' (1879), which has often been reprinted; 'Sermons' (1885); 'Memoirs' (1885), a somewhat morbid piece of autobiography extending only to 1860. Consult Morley, John, 'Critical Miscellanies' (Vol. III, London 1892); Tollemache, 'Recollections of Pattison' (1885).

PATTISON, Robert Emory, American politician: b. Quantico, Md., 8 Dec. 1850; d. Philadelphia, Pa., 1 Aug. 1904. He was admitted to the bar in 1872 but soon turned his attention to politics, and in 1877–82 was city comptroller of Philadelphia. Owing to a split in the Republicans, in 1882 he was elected governor of Pennsylvania, although his party was in the minority, and served four years when he resumed his law practice. He was president of the Chestnut Street National Bank, of the United States Pacific Railway Commission in 1887–90 and in 1891–95 again served as governor of his State.

PATTISON, Robert Everett, American Baptist clergyman and educator: b. Benson, Vt., 9 Aug. 1800; d. Saint Louis, Mo., 1874. He was graduated at Amherst College in 1830, was tutor in Columbian College, Washington, D. C., for a year, and afterward was professor of mathematics at Waterville College, Maine. He was ordained in 1833 and held charges at Salem, Mass., and at Providence, R. I. In 1836–39 he was president of Waterville College, and subsequently was pastor at Saint Louis, and at Providence. He was president of the Western Baptist Theological Seminary at Covington, Ky., in 1845–48; professor at the Theological Seminary at Newton, Mass., in 1848–54; and in

1854–57 was again president of Waterville College. He was afterward professor of theology at Shurtleff College, Alton, Ill., and at the Union Baptist Theological Seminary, Chicago. Author of 'Commentary on the Epistle to the Ephesians' (1859).

PATTISON, Thomas Harwood, American Baptist clergyman: b. Cornwall, England, 14 Dec. 1838; d. Rochester, N. Y., 13 Feb. 1904. He was graduated from Regent's Park College, England, in 1862, came to the United States, and last occupied the chair of homiletics and pastoral theology at the Rochester Theological Seminary. He published 'Present Day Lectures' (1872); 'The History of the English Bible' (1894); 'The Ministry of the Sunday School' (1902).

PATTON, Francis Landey, American educator and theologian, 12th president of Princeton University: b. Warwick, Bermuda, 22 Jan. 1843. He was educated at Knox College, Toronto, the University of Toronto and at Princeton Theological Seminary, where he was graduated in 1865. He was pastor of the 84th Street Church, New York, 1865–67, of the Nyack Presbyterian Church 1867–71, of the South Church, Brooklyn, 1871, and of the Jefferson Park Presbyterian Church, Chicago, 1874–81. While in Chicago he edited the *Interior*, a religious weekly; was professor of theology in the Presbyterian Theological Seminary, and was prominent in the anti-heresy movement in the Presbyterian Church, being prosecutor of Prof. David Swing (q.v.). He was moderator of the Presbyterian General Assembly in 1878. In 1886 he was elected professor of ethics at Princeton College, having removed to Princeton in 1881 to occupy a chair in the Theological Seminary, endowed by Robert L. Stewart and styled "Relations of Philosophy and Science to the Christian Religion." In 1888 he was chosen president of Princeton University, then called the College of New Jersey, but adopting the title of university in 1896. His admiration was marked by great growth in the wealth and numbers of students of the university. In 1902 he resigned, and a few months later was elected president of Princeton Theological Seminary. In 1891–92 he was prominent in the opposition within the Presbyterian Church to the action of Union Theological Seminary in upholding Dr. Charles A. Briggs (q.v.), who was accused of heresy. He has published 'The Inspiration of the Scriptures' (1869); 'Summary of Christian Doctrine' (1874), and many papers on philosophical and theological subjects.

PATTON, Frank Jarvis, American soldier and inventor: b. Bath, Me., 1852; d. New York, 12 Nov. 1900. After graduation from West Point in 1877, he was assigned to the 21st Infantry, rose to the rank of 1st lieutenant in 1884, and resigned from the service in 1889. He experimented much with electricity, and was the inventor of the multiplex telegraph system. Among other devices of his was that of the gyroscope, used to determine the position of vessels in mid-ocean.

PATTON, Jacob Harris, American historian: b. Fayette County, Pa., 20 May 1812; d. 1903. He was graduated from Jefferson College, Pennsylvania, in 1839, and from Union Theological Seminary in 1846. He was tutor in Union Seminary in 1843–46, in Nashville University 1840–43 and in the New York Classical School in 1846–87. Among his publications are 'A Concise History of the American People' (1869–82); 'Yorktown, 1781–1881' (1882); 'Natural Resources of the United States' (1888); 'Political Parties in the United States' (1902).

PATTON, Pa., borough in Cambria County, 65 miles northeast of Pittsburgh, on the Pennsylvania and New York Central railroads. It has agricultural, coal mining and coke interests and manufactures bricks and fire-clay products. Pop. 3,907.

PATUXENT, pą-tuks'ĕnt, a river of Maryland, which rises in the north of the State about 20 miles east of the city of Frederick, flows southeast and then south and empties into Chesapeake Bay through a large estuary. It is 90 miles long, is navigable for almost 50 miles and contains oyster beds of great value.

PATZCUARO, pätz'kwä-rō, Mexico, city in the state of Michoacán, 30 miles southeast of Morelia and a little southeast of the lake of the same name, on the shores of which was the city of Tzintzuntzan, the capital of the Tarascas and the centre of the great Michoacán Empire. The present city, 7,500 feet above sea-level, occupies much the same site. It is an old and picturesque town. It contains the tomb of Vasco de Quiroga, an early bishop of Michoacán and missionary to the Indians, and is famed for the handiwork of the natives, notably feather picture work, cloaks and furniture. There are sugar, tobacco and mining industries centred there. Pop. about 8,000.

PAU, pō, **Paul,** French general: b. Montéhmar, 29 Nov. 1848. He was graduated at the Military Academy at Saint Cyr in 1867, and at the outbreak of the Franco-Prussian War in 1870 he was a lieutenant in the infantry. He was seriously wounded in August of that year, losing his right arm, but returned to duty when recovered and was promoted captain in 1871 and received the Cross of the Legion of Honor. He remained with the army, became general of brigade in 1897 and of division in 1903. In 1911 he was offered the post of chief of the general staff, but declined it. He was commandant of the 16th Army corps at Montpellier and later of the 20th Army corps of Alsace, and was in charge of important operations in Alsace in the early months of the European War. He represented France on diplomatic missions to Russia, Italy and the Balkans in 1915, and in 1918 headed the French economic mission to Australia. He was a member of the Council of War in the European War and ranks among the foremost of the French military leaders of his day.

PAU, France, capital of the department of Basses-Pyrénées, on a lofty ridge on the right bank of the Gave-de-Pau, here crossed by a fine bridge, 58 miles east-southeast of Bayonne, and commanding a magnificent view of the western Pyrénées. It has several squares, notably the Place Royale, with a finely planted promenade and a marble statue of Henry IV, and the Place-de-la-Comédie, communicating with a suburb by a bridge which spans a deep ravine. The most conspicuous and interesting edifice is the castle in which Henry IV was born, crowning a lofty peak at the western extremity of the town, and overhanging the Gave. It is a huge, angular and irregular structure, flanked with towers, of which five still remain, the highest (the Tour de Gaston-Phœbus) or dungeon having a height of 100 feet, and another, called the Tour de la Monnaie, being the traditional asylum which Margaret of Valois gave to Calvin and other persecuted reformers. The greater part of the castle was restored in good taste by Louis Philippe. Pau has a Court of Appeal for the departments of Basses-Pyrénées, Hautes-Pyrénées and Landes; courts of the first resort and commerce; an academy, college, museum, library, a winter palace, since 1896, in Beaumont Park, agricultural society and society of science, literature and art. The manufactures of Pau consist of napkins, excellent table linen, rugs, carpets, paper and leather. The trade is in wine, Bayonne hams, salt provisions, excellent chestnuts, printed cottons, iron, marble and leather. Pau has produced two sovereigns, Henry IV and Bernadotte (Charles XIV of Sweden). It is a favorite resort of the English in winter, having a mild, dry climate, with no sudden variations of temperature. It is a convenient starting-place for travelers desirous of exploring the Pyrenees. Pop. about 37,000.

PAUER, pow'ĕr, **Ernst**, Austro-English musician: b. Vienna, Austria, 21 Dec. 1826; d. 1905. He was educated in Vienna and Munich and was successful, both as a director of musical societies and in giving historical piano recitals. He was director of musical societies in Mainz (1847–51), when he went to London, where he became professor in the Royal Academy of Music in 1859. Though holding positions and doing extensive musical work in England he still retained close relationships with the Continent where he continued to give concerts and recitals to large and critical audiences. In 1866 he was appointed pianist at the Austrian court, and he lectured in England and Ireland on the history of music from 1870 until his retirement to his villa at Jugenheim near Darmstadt in 1896. He was appointed professor of the National Training School for Music at Kensington Gore in 1876; in 1878 was a member of the musical board at Cambridge and in 1879 was appointed examiner there. He edited the works of various great composers and among his operas are ‘Don Riego’ (1849); ‘Die Brautschau Friedrichs des Grossen’ (1861). Pauer may be said to have introduced the English, as a people, to German music which he made immensely popular in London and, later on, throughout Great Britain. He also did much to popularize old English musical compositions. He published ‘The New Gradus ad Parnassum.’

PAUL, Saint. See SAINT PAUL.

PAUL I, Saint: d. Rome, 28 June 767. He was the successor of Stephen III, his brother, in 757. He was ably supported in his pontificate by Pepin I, king of the Franks, who assisted him in disputes with the Lombards and the Byzantine emperor, who still laid claims to the exarchate and the Pentapolis. Consult Mann, H. K., ‘Lives of the Popes’ (Vol. I, Part II, London 1902).

PAUL II (PIETRO BARBO, pē-ā'trō bär'bō): b. Venice, 26 Feb. 1418; d. Rome, 28 July 1471. He was a nephew of Pope Eugenius IV; became a cardinal in 1440, and exercised a very strong influence over Nicholas V and Calixtus III. He succeeded Pius II in 1464. His first endeavor was to form an alliance of the Christian princes against the Turks, who at the time threatened to invade Italy, but in this he failed, not because his plans were not well formed and opportune, but because he was forced to oppose the claims to absolute power of Louis XI of France. He sought to stem the pagan tendencies of the Renaissance spirit, and took stringent measures against the heretical teachings of some of the Humanists of the time, even to closing the Roman Academy, which had become a hotbed of opposition to the papal claims and the progress of Christianity. Paul II promulgated very severe laws for the punishment of those scholars and others who taught pagan doctrine or practised pagan immorality. Consult Creighton, M., ‘History of the Papacy’ (Vol. IV, New York 1913); Pastor, L., ‘History of the Popes’ (Vol. III, London 1910).

PAUL III (ALESSANDRO FARNESE, ä-lĕs-sän'drō fär-nä'sĕ): b. Canino, 29 Feb. 1468; d. Rome, 10 Nov. 1549. Educated in Rome under conditions which brought him into contact with the ruling class, he went to Florence where his family connections enabled him to enter into close relations with the Medici. He was made a cardinal in 1493 by Alexander VI, and subsequently became bishop of Ostia and the dean of the Sacred College, and twice represented the Pope, during his absence, as legate in Rome. He was elected to the papal chair in succession to Clement VII in 1534. He had previously urged the summoning of a council of the Church and after he became Pope called a council to meet at Mantua in 1536, at Vicenza in 1538 and at Mantua again in 1542. Disputes between Charles V and Francis I prevented the assembly of the council on each occasion, but in 1545 it met at Trent. (See TRENT, COUNCIL OF). He was a vigorous suppressor of heresy, re-established the Inquisition in Italy, approved the Order of Jesuits, condemned slavery in 1537, established a very strict censorship of books and excommunicated Henry VIII of England. He very greatly advanced the interests of the Catholic Church and did much to establish its stability. Yet he was very much of a politician and he looked after the welfare of his relatives and his natural children, one of whom, Pietro Luigi Farnese, he made Duke of Parmia and Piacenza. He is remembered gratefully in Italy as a liberal and judicious patron of art; and numerous notable buildings are due to his initiative. Michelangelo was appointed by him chief architect of the Vatican and also of Saint Peter's at Rome. Consult Pastor, L., ‘History of the Popes’ (Vol. VIII, London 1908).

PAUL IV (GIOVANNI PIETRO CARAFFA): b. Naples, 28 June 1476; d. Rome, 18 Aug. 1559. He became archbishop of Brindisi in 1518, founded the order of secular clergy known as Theatines in 1524, was made cardinal in 1530 and in extreme old age (1555) succeeded Marcellus II. He nevertheless displayed a vigor in his pontifical office, which had not been looked for in one of his advanced age and previous studious habits. He established a censorship, completed the organization of the Roman Inquisition, undertook the alleviation of the burdens of the poor and the more vigorous administration of justice, and also banished his own nephews from Rome on account of their dissolute life. He joined with France in the war for the conquest of Naples (1555–57) and condemned the provisions of the Peace of Augsburg. With a view to reforming undesirable conditions in the Church he established the secular clergy called Theatines (q.v.) of which he was himself the first and very active superior. When he became Pope he used all his influence to improve the morality of the lives of the clergy and of the public in general. He insisted on the restoration of church property in England; and on Queen Elizabeth's accession to the throne he declared her illegitimate and, therefore, not legally queen. He got into trouble with other rulers and at home he was very unpopular on account of his want of tact and his enforcement of his own construction of morality. Consult Van Ranke, Leopold, 'History of the Popes' (London 1908).

PAUL V (Camillo Borghese, kä-mēl'lō bŏr-gā'sĕ): b. Rome, 17 Sept. 1552; d. there, 28 Jan. 1621. In the earlier part of his career he was prominent as a theologian, and in 1596 he became a cardinal. He succeeded Leo XI in 1605. He was a vigorous, able administrator and among important incidents of his pontificate were a conflict with Venice which resisted him so stoutly that he excommunicated the Doge and Senate, the establishment of the Congregation of the Oratory, and the orders of the Ursulines and the Visitation; and great activity in mission work in heathen lands. The arts also flourished under his direction. Consult Trollope, T. A., 'Life of Paul V' (1861).

PAUL I, Petrovitch, tsar of Russia, son of Peter III and Catherine II: b. 1 Dec. 1754; d. 24 March 1801. His father refused to acknowledge his legitimacy, and his mother treated him with great severity so that his naturally good disposition became morose, sullen and fitful. He succeeded her, in spite of her plans to exclude him from the throne, in 1796; removed all her favorites and punished his father's murderers. He released Kosciusko and other captive Poles, re-established the rule of male succession to the throne and bitterly opposed everything French, even suppressing pamphlets which approached Jacobin sentiments merely in containing such words as «citizen» and «society.» After the French invasion of Egypt he formed an alliance with England against the republic, sending armies to Holland, Switzerland (under Khorsakoff) and Italy (under Suvaroff). The defeat of the second army followed close on the heels of the great victory of the third. Suvaroff barely escaped, and Paul, won by Napoleon's artfulness and out of humor with his English allies, who refused to surrender to him the island of Malta, to which he held title through Louis XVIII, his royal guest, now broke with the English, joined Napoleon most heartily, dismissed Louis from Russia and formed with Sweden, Denmark and Prussia the armed neutrality, which was calculated to ruin England. But his despotism at home, his demands that everybody prostrate himself before him, and the rumor that he intended to disinherit his son Alexander, roused a plot against him, to which Alexander was privy. Paul was to be forced to abdicate and Alexander would then become regent. But when the conspirators broke into his room and bade him sign his abdication, he refused, attempted to make his escape and was killed, probably being strangled with a sash cord. Paul seems to have begun his reign with intention to govern well; but his determination to rule as arbitrary monarch soon forced him into oppressive despotism which depressed the intellectual, spiritual and military life of the nation. Suspicious beyond all his royal predecessors, Paul I developed a spy system more extensive, far-reaching and effective than anything in the same line heretofore known among the Christian nations. This was followed up by the quick, certain and relentless punishment of those found guilty of disloyalty, or even suspected of it. Thousands of innocent victims were sacrificed to the inordinate fear of treachery which possessed the monarch. Yet there are numerous evidences that Paul I took his kingly office seriously. He permitted the peasants, for the first time in history, to take the oath of allegiance to the throne, thus giving them a sort of legal recognition. He followed this up by prohibiting, in 1797, the lords from working their serfs on holidays, or more than three days a week, and the following year another decree made it illegal to sell peasants without lands in Little Russia. Paul I also separated the estates and income of the imperial family from those of the state; and he established the rule of succession to the throne whereby it should pass from father to son, and in case there were no son, to the eldest surviving brother. Consult Bienemann, 'Aus den tagen Kaiser Pauls' (1886); Schiemann, 'Die Ermordung Pauls und die Thronbesteigung Nikolaus I' (1902); Waliszewski, K., 'Paul I' (London 1913).

PAUL, Charles Kegan, English publisher and author: b. White Lackington, Somerset, 8 March 1828; d. London, 19 July 1902. He was educated at Oxford, took orders in the Church of England, was made curate of Great Tew (1851) and Bloxham (1852), and after 10 years of teaching at Eton became vicar of Sturminster, Dorsetshire. His views gradually developed a positive character, and he, therefore, withdrew from his living and became reader for the publishing-house of H. S. King, to whose business he later succeeded. His firm published many important works and the *Nineteenth Century Review.* In consequence of financial troubles the concern was transformed into a limited company, of which Paul was manager until his retirement in 1899. Toward the close of his life he entered the Roman Catholic communion. Among his works are 'William Godwin'; 'Biographical Sketches'; 'Faith and Unfaith'; 'Memories'; 'Letters of Mary Woolstonecraft'; 'Biographical Sketches'; 'Marie Drummond.'

PAUL, John. See Webb, Charles Henry.

PAUL, Lewis, English inventor: d. Brook Green, Kensington, April 1759. In 1738 he obtained a patent for a cotton and wool spinning machine, this patent comprising an invention now in use in most of the world's cotton-mills. This invention consists of two pairs of rollers, one of which revolves at a velocity greater than that of the other. Factories were established to make use of his patent in Birmingham and Northampton. His invention never brought

Paul substantial returns, and was commercially successful only when later improved by Arkwright. Among his other inventions are those of a carding-machine (1748) and another spinning-machine (1758). Paul was a correspondent of Dr. Johnson.

PAUL CLIFFORD, a novel by Bulwer, published in 1830. It derives its name from that of its hero, and the author's purpose in writing it was to appeal for an amelioration of the British penal legislation, by illustrating to what criminal extremes the ungraded severity of the laws was driving men who by nature were upright and honest.

PAUL OF THE CROSS, Saint, Italian religionist, founder of the Order of Passionists: b. (PAOLO FRANCESCO DANEI) Ovada, near Genoa, 1694; d. Rome, 18 Oct. 1775. With a few associates he led a life of religious retirement on Mount Argentaro (Orbitello), where it was divinely revealed to him that he was to be the founder of an order, and even the habit was shown. The bishop of Alessandria permitted Paul to assume this habit, and, as a layman, to preach repentance. In 1727 he was ordained priest, and in 1737 established on Mount Argentaro the first Passionist settlement. Benedict XIV formerly approved the order in 1741. Paul was canonized in 1867; his day is 16 November.

PAUL-DUBOIS, pōl dou'bwä, **Louis François Alphonse**, French economist: b. Paris, 1868. He received his education at the Lycée Louis-le-Grand, studied law and was appointed referee at the audit office. His published works are 'Les chemins de fer aux Etats-Unis' (1896); 'Les finances communales' (1898), which won him the Fancher Prize from the Academy of Moral and Political Sciences; 'Frédéric le Grand d'après sa correspondance politique' (1902), which was awarded the Montyon Prize by the French Academy; 'L'Irlande contemporaine et la question irlandaise' (1907; English translation under the title 'Contemporary Ireland,' 1908).

PAUL PRY, a comedy by John Poole, published in England in 1825 and often attributed to Douglas Jerrold. The character from which the play takes its name is that of a meddlesome mischief-maker drawn from one Thomas Hill, a journalist.

PAUL OF SAMOSATA, a heresiarch of the 3d century. He became patriarch of Antioch in 260, and acquired great wealth. He caused the hymns of the Church to be abolished and others sung in praise of himself, and surrounded himself with a number of young and beautiful women. In defiance of the ecclesiastical canons he held the office of *ducenarius*, a sort of procuratorship under the emperor. He was a friend of Zenobia, queen of Palmyra, an admirer of his eloquence. He taught that there was only one God, who is the Father; that the Word or Wisdom of God was not a substance or person, but was in the divine mind as reason in men; that Christ was a mere man who acquired this Word or Wisdom of God, becoming by it both God and the Son of God, though both in an improper sense, and gradually acquiring his knowledge and virtues. His opinions were condemned in a council held about 264. Failing, however, to retract them he was deposed at the Council of Antioch in 269. He passed the latter years of his life in obscurity. Consult Harnack, Adolf, 'History of Doctrine' (translated into English by Neil Buchanon, Boston 1898).

PAUL OF THEBES, Saint, early Christian hermit: b. Thebes, Upper Egypt, 228 A.D.; d. 340. He is the first well-known Christian hermit, as distinguished from the still earlier ascetics, of whom very little is known. Saint Jerome credits him with being the founder of monasticism. In 250 A.D., during the Decian persecution, he retired to a desert cave, and there lived until his death, a near-by spring and palm supplying him with food, clothing and shade. In later years ravens are said to have ministered to him, as to Elijah. He received in his seclusion Saint Anthony, whom he trained to became his successor in the establishment of the hermit life. Jerome wrote his life, and rejected as incredible many of the fabulous tales told regarding him, which could scarcely have been more remarkable than those still narrated. His day in the Roman Catholic Church is 15 January. Consult his life by Joseph Bidez.

PAUL OF VENICE, or BROTHER PAUL (Fra Paolo). See SARPI, PAOLO.

PAUL VERONESE. See VERONESE, PAOLO.

PAUL ET VIRGINIE (Paul and Virginia), the novel which made Bernardin de Saint Pierre famous and has caused many tears to flow since its publication in 1787, is the romance of two children of same age brought up according to nature by their families living in the tropical Ile de France (Mauritius). Their childhood affection, grown later into love, is further intensified during a separation caused by Virginie's trip to France; and after she perishes in the wreck of the ship which was bringing her back to the island and to Paul, he soon dies of a broken heart. This little work is the symbol of the ideals of a peaceful Utopia which the author had vainly tried to realize during his wanderings in early life. Friend and disciple of Rousseau, he was greatly influenced by the latter's ideas and even by his style. In 'Paul et Virginie' are found many imitations of 'La Nouvelle Héloïse,' and Bernardin de Saint Pierre continues Rousseau's philosophy in contrasting natural goodness and social corruption. The novel, hardly more than a sketch, has little plot and is lacking in power of analysis or character study; it is besides encumbered with many sentimental dissertations on nature, the simple life, virtue, love, misfortune, death, etc. Withal it has a charm of its own which comes from a touching picture of childhood life with its joys and its sorrows, expressed in a style full of local color. Descriptions of nature in the tropics with its luxurious vegetation, brilliantly colored birds, perfume-laden flowers and strange harmonies, contributed largely to the success of the book and reveal the author as a master painter, the first «artist» writer in French literature. Because of his influence on Chateaubriand and Lamartine, Bernardin de Saint Pierre is considered as one of the precursors of Romanticism.

LOUIS A. LOISEAUX.

PAULANITES. See Orders, Religious.

PAULDING, päl'dĭng, **Hiram**, American naval officer: b. New York, 11 Dec. 1797; d. Huntington, N. Y., 20 Oct. 1878. He entered the navy in 1811, distinguished himself in the War of 1812, particularly at the battle of Lake Champlain. After the war he served on the *Constellation* of Decatur's squadron against the Barbary powers; in 1822–23 he was 1st lieutenant of the *Sea Gull*, said to be the first steam-vessel used in war, in an expedition by Porter against West Indian pirates; and he was made captain in 1844, after which he cruised for three years (1844–47) in the sloop *Vincennes* in East Indian waters. He commanded at the Washington navy yard in 1851–54, and in 1854–57 was in command of the home squadron. In December 1857 he arrested William Walker (q.v.), the filibuster, at Greytown, Nicaragua. He acted without instructions, and his conduct in apprehending Walker on foreign soil was not approved by President Buchanan, who relieved him of his command. The republic of Nicaragua, however, presented to him a sword, and offered also a large tract of land, which the United States government did not allow him to accept. On the outbreak of the Civil War he was called by Lincoln to Washington to assist Secretary Welles in putting the navy in trim; and in April 1861 he destroyed the navy yard at Norfolk, Va., to prevent its valuable stores from falling into the possession of the Confederates. He was technically retired in 1861 on the age limit; but in 1862–66 was commandant at the New York navy yard; in 1866–69 governor of the naval asylum at Philadelphia, and in 1870–71 port-admiral at Boston. He was promoted rear-admiral on the retired list in 1862. He wrote 'Journal of a Cruise Among the Islands of the Pacific' (1831). Consult Meade, R. P., 'Life of Hiram Paulding' (New York 1910).

PAULDING, James Kirke, American author: b. Nine Partners, Dutchess County, N. Y., 22 Aug. 1779; d. Hyde Park, N. Y., 6 April 1860. At 19 he went to New York, the home of his brother William, and of William Irving, who had married Paulding's sister and who was the means of his acquaintance with Washington Irving. In 1807 the two Irvings and Paulding brought out the first copy of *Salmagundi*, a satiric literary periodical, which met with immediate success, but was discontinued at the end of a year, when the publisher refused to pay the authors. Paulding was not, however, dependent on his writings for support as he held a public office in New York City. In 1812 he gained fresh praise by a spirited national satire, 'The Diverting History of John Bull and Brother Jonathan,' which allegorizes the difficulties between Great Britain and the United States. The same theme was cleverly treated in prose in a pamphlet called 'The United States and England,' which brought him the post of secretary to the board of navy commissioners. Much of his time and energy were spent in writing editorials for the New York *Evening Post* and in other political hackwork, and many of his literary ventures during this time were of little value and had small success. This is notably true of 'The Backwoodsman' (1818), an epic of pioneer life, and of a new series of *Salmagundi* (1819). But in the lighter vein of humor and fiction he was more at home; 'Königsmarke,' a story of the early Swedish settlers (1823), 'John Bull in America, or the New Munchausen' (1824), 'The Merry Tales of the Three Wise Men of Gotham' (1826), a 'Chronicle of the City of Gotham' (1830); and the very successful story, 'The Dutchman's Fireside,' are the best of his works. From 1825 to 1837 he was navy agent at the port of New York, and in the latter year became Secretary of the Navy, in which position he stubbornly opposed the introduction of steam-driven vessels into the navy. He retired in 1841, published a Revolutionary novel called 'The Old Continental' (1846), 'American Comedies' (with his son, William Irving Paulding, 1847), and 'The Puritan and His Daughter' (1849), another historical novel. His verse was mediocre, the tongue-twisting lines beginning "Peter Piper picked a peck of pickled peppers," which appeared in 'Königsmarke,' being his surest claim to poetic fame. As a politician he was very conservative; his 'View of Slavery in the United States' defends the institution. His true literary strength lay in his fund of original humor. His selected works (1867–68) and his 'Literary Life' (1867) were edited by his son, William Irving Paulding.

PAULDING, John, American soldier: b. New York, 1758; d. Staatsburg, N. Y., 18 Feb. 1818. He enlisted in the Federal army at the outbreak of the American Revolution, served through the war and was three times taken prisoner. His fame rests upon his being one of the captors of Major André, for which service to the American cause he received a silver medal from Congress and a pension of $200. A monument was erected over his remains at Peekskill, N. Y., in 1827 by the city of New York, and the monument erected at Tarrytown, N. Y., on the spot of the famous capture has the figures of Paulding and his companions reproduced in the act of searching André for the secreted papers.

PAULICIANS, pâ-lĭsh'ạnz, Manichæans and Gnostics who in the 8th century assumed the name of Paulicians, from Paul of Samosata, bishop of Antioch, their leader, to save themselves from persecutions, according to one view of their origin. Recent investigation, however, would seem to show that the Paulicians had an independent origin. As iconoclasts they were favored or persecuted by the Greek emperors according as the latter were favorable or otherwise to the worship of the images, which the Manichæans totally rejected. In the 9th century they were subjected to violent persecution. Many of them were put to death; others fled to Mohammedan countries. When the Crusaders had opened a way to the middle of Europe, companies of this sect passed as pilgrims from the Holy Land up the Danube, and entered Italy with the Levant trade through Venice. The Vaudois and Albigeois sects (Waldenses and Albigenses) are said to have sprung from this stock. Such is the account given of them by Photius and Petrus Siculus, but a different view has been taken by modern ecclesiastical historians. According to these writers the sect was founded by one Constantine of Mananalis, who conceived so great a veneration for the Apostle of the Gentiles that he assumed his name. They rejected the adoration of the Virgin and the saints, and refused homage to the cross; they denied the validity of the sacraments, interpreting spiritually baptism and the Lord's Supper; would not recognize any priestly dignity; and their public worship was altogether free from ritual. In the 9th century under Baanes, the Paulicians became very active and this led to the persecution already noticed. A remnant of this sect is said by a modern Greek historian to have survived at Philippopolis to the beginning of the 19th century, and many still existed in Armenia at this latter date. See RELIGIOUS SECTS. Consult Adeney, W. F., 'Greek and Eastern Churches' (New York 1908); Conybeare, F. C., 'The Key of Truth' (the book of the Paulicians, Oxford 1898); Gibbon, Edward, 'Decline and Fall of the Roman Empire' (Vol. VI, London 1912); Lynch, H. F. B., 'Armenia' (London 1901); Newman, A. H., 'Manual of Church History' (Philadelphia 1900).

PAULINE EPISTLES, the name by which 13 books of the New Testament are commonly known, namely, Romans, 1 and 2 Corinthians, Galatians, Ephesians, Philippians, Colossians, 1 and 2 Thessalonians, 1 and 2 Timothy, Titus and Philemon. A 14th book, the Epistle to the Hebrews, has been widely regarded as from Paul's pen, but the marked variance in form, style, manner of reasoning and type of thought from the epistles generally recognized as his, has caused this epistle, which neither claims Paul as author nor was attributed to him by the earlier Fathers, to be at the present time all but unanimously regarded as non-Pauline.

Of the four first named of these 13 epistles, Paul's authorship has never been doubted by any sober criticism. The attempt of van Manen and a few other critics to revive the view of Bruno Bauer, that no writings at all of the Apostle have been preserved, have had no influence on the general opinion of scholars. The claim that there are decided inconsistencies in these letters is dismissed with practical unanimity as "hypercriticism," and it is recognized that in no period of the history of the Church before 125, soon after which the epistles appear to have been widely accepted, would the four chief epistles fit as they fit into the circumstances of the apostolic age, so far as they can be known, as, for instance, the Judaistic controversy among the Galatian churches. But, to leave out of account the later unanimous tradition of the Christian Church touching the Pauline epistles, before the close of the 1st century the letter of Clement of Rome to the church at Corinth decisively attested Paul's authorship of First Corinthians, and the likeness which runs through the four great epistles makes testimony to one to be indirectly testimony to all. It would, indeed, be incredible that any writer of the 2d century, especially a Christian chiefly intent on foisting on the Church at large under the name of Paul his own doctrinal views, could have conceived and depicted with such consistency and vividness such a nature as that of Paul,— fervid, profound, impetuous, self-mastered, tender, strong, a personality so rich in so many elements of character.

If the four chief letters are accepted as Pauline, because certified to by unanimous tradition, undisputed by sound criticism and sufficiently self-evidencing, it will follow for similar convincing reasons that First Thessalonians, Philippians and Philemon should also be accepted, as, indeed, they are to-day by the great majority of unbiased critics. On careful consideration Second Thessalonians will commend itself as Pauline alongside the First Epistle, which in style it strongly resembles, but not so closely as to necessitate the hypothesis of copying, while the difference between the two epistles in the presentation of the eschatological teaching would be unnatural, if another were writing under the name of Paul. In spite of an unlikeness in style to the epistles already discussed, the Pauline authorship of Colossians has found steadily increasing favor among critics, so that it is now quite generally accepted, especially in view of the facts that the historical notices seem too natural to have been fabricated, and that the errors against which it was directed prevailed in that form only early. If Colossians can be accepted as Paul's own, no reason remains for doubting his authorship of Ephesians, for the unlikeness in style to his earlier writings is no greater than was the case with its sister epistle, and the great likeness of Ephesians to Colossians, which has been used in argument against the genuineness of the former, is no more than might easily have resulted when two letters were written practically simultaneously. As touching 10 of the epistles then the tradition of the Church has after long and keen debate been verified by the verdict of critical scholars, in most cases with practical unanimity, in the remaining cases by a decisive majority.

With the "Pastoral Epistles," so-called, First and Second Timothy and Titus, the case stands otherwise and is still open. The traditional and patristic attestation is as strong for these epistles as for the rest, for the rejection of them by the heretic Marcion should be explained as due to his hostility toward their teachings. The argument against accepting them is threefold: first, that no place can be found for them in the life of Paul so far as it is known to us from Acts; second, that the style both in use of words and in general tone is decidedly unPauline, and, third, that they presuppose conditions ecclesiastical and doctrinal which could not have existed in the Church till the 2d century. In answer to the first it should be said that, if Paul was released from his first imprisonment, there was opportunity for the composition of these letters and for all that carries with it, and that history and tradition are quite as consistent with release as with a fatal issue of his case. As to the second class of arguments it must be recognized that we do meet language and a literary tone in some degree new, although but a brief interval between their appearance and that of preceding letters could have elapsed, but this might be due to any of several things, the use of a literary assistant, for example, who somewhat modified the Apostle's own style, and the existence of such circumstances can no more be positively denied than asserted. As to the third, it ought to be noted that there exist no standards by which to measure the rapidity of development in the life and organization of the primitive churches; and further, that the ecclesiastical constitution of the churches, the heretical views which seem later to have merged into Gnosticism and the hostile relation of the

Roman government, all seem less developed than we should expect to find them even as early as the year 100, much later than which those who doubt the Pauline authorship usually date their composition. Perhaps no positive answer can now be given to the problem as to the genuineness of the Pastoral Epistles, although there is a growing agreement that the historical notices which they contain are largely genuine, a fact which additionally complicates the problem. While the attempts to remove all the difficulties which surround these letters have not yet been fully successful, it seems on the other hand impossible to disprove their Pauline authorship.

In the following survey of the several epistles and their various occasions and characters, no attempt has been made to date them absolutely, but only relatively by placing them in connection with other parts of Paul's work as a missionary. (For an approximation to the absolute dating see article NEW TESTAMENT CHRONOLOGY).

What has usually been regarded as the earliest of Paul's extant writings is the First Epistle to the Thessalonians, but naturally it does not follow that he had never written such letters before, any more than that all which he wrote afterward have been preserved. On his second great missionary tour, after a short work at Philippi, his first work in Europe, Paul next preached at Thessalonica, now Saloniki, then the capital of one of the four divisions of Macedonia, and a busy and important city. Here for three weeks he preached in the synagogue, and then elsewhere to the Gentiles for we know not how long, possibly for months. But after a time the hostility of the Jews succeeded in driving Paul and his companions out of the city, and passing through Berea he went on to Athens, from which place Timothy was sent back to Thessalonica, not to rejoin the Apostle until after he was established at Corinth. His news was such that Paul at once wrote to the church touching three points: after expressions of gladness at their faith steadfast amid persecution, he assured them, in reference to calumnious accusations of which the rumor had been brought to him, that he really was still profoundly interested in them, and had repeatedly endeavored to revisit them; he warned them against heathen vices, and also against idleness and pauperism, and, finally, he instructed them about the resurrection of the believing dead at the return of Jesus which they were to expect. A second letter to the same church soon followed the first, by which in some sense it was occasioned. It seems that the stress laid upon the expected return of Jesus had led some to regard it as imminent, and to correct this misunderstanding of his views Paul wrote again in much the tone and even the language of the first, but adding the corrective teaching that much must happen before Christ comes.

Because of the very uncertainties which attach to it the Epistle to the Galatians may best be discussed next. The destination, the place of writing and the date of this epistle are all uncertain and strongly disputed. Those to whom it was addressed were formerly looked for with practical unanimity in the northern part of the Province of Galatia, but of late many scholars have located the Galatian churches in the southern part of the province, in the cities of Pisidian Antioch, Iconium, Derbe, Lystra and their neighbors. Certainly on this theory the Epistle gains greatly in vividness. The date and place of writing go together, and hang somewhat on the answer to the question of destination. If the Galatians of the letter are to be found in northern Galatia, then it is all uncertain when and where the letter was written, after the Thessalonian Epistles or before the Cæsarean imprisonment. On the South Galatian theory, it might even have preceded First and Second Thessalonians though probably not, and must have been written before Paul left Antioch for the last time, on his third tour. But whatever the uncertainties which thus surround the letter, when we take it up to read all is distinct. The Galatian churches had been approached by teachers who insisted that Christianity was incomplete and salvation impossible if keeping the law of Moses was not added to that simple faith in the crucified Christ which had been the converting message of Paul. To meet this condition he wrote with the utmost ardor and force, urging first that the message which he had presented must be adhered to because it had come to him by revelation and hence was finally authoritative, and then, not to rest in authority alone, that this view was the only one which was consistent with the facts of Judaism itself and with Christian experience; finally he sets forth the power of Christianity to secure a good life, the indwelling Spirit of God. While in his surprise and distress at the threatened apostasy of his converts Paul is much less considerate of form and phrases of address than is his wont, partly as a result the epistle is one of unsurpassed intensity, vividness and force.

After a stay of 18 months in Corinth where the Thessalonian letters were written, Paul left the church which he had founded there, and, having visited Jersualem and Antioch, established himself at Ephesus for a three years' ministry in that city. During the latter part of this time disquieting rumors reached him in various ways as to the condition of the Corinthian Church. It was rent into factions; it was tolerating gross immorality; the meetings for worship were disorderly, and even the Lord's Supper was a scene of confusion; more than one question had come to be of such practical importance that the church consulted the Apostle about it by letter, and, finally, reiterated instruction on the topic of the resurrection had become indispensable. Out of this situation grew the First Epistle to the Corinthians with its wealth of practical directions, warnings, instructions and exhortations beyond all Paul's other writings.

To the first letter to the Corinthians he was later obliged to add a second. While much of the purpose of First Corinthians seems to have been gained by it, at the same time disaffection against Paul and keen hostility to him appear to have even increased in some quarters so greatly that until this sentiment could be changed it seemed best not to revisit Corinth himself. He had sent both Timothy and Titus on special missions, and in his anxiety himself removed from Ephesus to Macedonia in order to know soonest and surest the condition of the church and their attitude toward himself, his anxiety being rendered keener from the nature of a letter which he had sent, which it had cost him pain to write and which might have been too severe in tone for his purpose, a letter which can scarcely have been our First Corinthians, and must be lost, unless the acute but unverifiable suggestion of several critics is correct, and Second Corinthians (x–xiii) constitutes the kernel of the supposedly lost letter. In the state of mind natural to any ardent and affectionate nature in the face of intense and unscrupulous hostility Paul wrote the most personal of all his letters, a letter largely autobiographic in character, by turns tender and severe, pleading and sarcastic, though these qualities are most strikingly present in the second part of the letter, which, as has just been said, some would separate from the rest. In marked contrast to the First Corinthian Epistle, the great value of which lies in its practical instructions, the interest of the Second lies mainly in the revelations which Paul makes as to his history and sentiments and relations to friend and foe. The effect of the Epistle must have been salutary if not, indeed, completely satisfactory, for the letter to the Romans proves that he was soon after present in Corinth.

The Epistle to the Romans, the longest and apparently the most carefully prepared of all his epistles, was addressed to a church which he had not planted and which he had never visited. Naturally it must be more general in character than the rest, for there was nothing in the occasion of it which would limit its purport and scope. Having now completed the work which had pressed upon him in the Eastern world, having established Christianity in the great centres of Syrian Antioch, Pisidian Antioch, Ephesus and Corinth, beside many less important places like Philippi and Thessalonica, the Apostle's eye now turned westward and his thought fixed itself next on Rome, the capital of the world, whither everything in the empire tended, whence influence radiated to every part of the empire. While of course the fact that Christian work was effective at Rome would not ensure that it would reach the upper classes elsewhere, yet the fact would immensely increase its influence in the classes that might be touched. We have no historical basis as to when or how Christianity was planted at Rome; we only know that it was in existence and that in the constant ebb and flow of migration the faith of its members was widely and favorably known. While to many there Paul with his wide acquaintance would naturally be personally known, a supposition with which the number of his greetings at the end of the Epistle is in perfect harmony, yet to more he must have been still unknown, and doubtless not a few would by the persistent misrepresentations of his enemies have been brought into a temper of hesitancy and suspicion about him. Because he hoped soon to visit Rome, and because at the same time his projected journey to Jerusalem would certainly delay the visit, how much he could not and did not foresee, he wrote a letter which might prepare the way for his later ministry with the church at Rome. With a dignity and thoroughness worthy of the occasion, Paul proceeded to write his answer to the three great questions then dominating theological controversy: How can a man secure God's forgiveness and favor? What will be the life of a forgiven believer? How does this gospel of a grace that comes indiscriminately to Jew and Gentile on the sole condition of faith fit with the ancient promises to Israel, and how explain the failure of the Jews to accept this gospel of Christ? Accompanying his answer to these questions with statements which involve his conclusions on almost every doctrinal point, the letter continues beyond the theological discussion to furnish a rapid summary of the duties of the Christian life with more stress than he elsewhere laid on the duties of the citizen toward those in public authority.

As perhaps the next letter after those to the Corinthians was written at Corinth, so after the letter to the Romans the next letters were written from Rome. There are four letters which were penned while Paul was living a prisoner in his own hired house in Rome, and three of the four, those to the Ephesians, to the Colossians and to Philemon constitute the most closely related group among the Pauline epistles. The only clue as to whether Philippians preceded the others of this group in time or followed them is found in Paul's expressions of feeling as to whether he might expect release as the result of his appeal to Cæsar. These statements are, however, too uncertain to justify positive conclusions as to the order of the four epistles. In character the Epistle to the Philippians is the least doctrinal in substance and the most affectionate in tone of all Paul's letters. Such doctrinal teaching as is found in this epistle is enwrapped in the incidental declarations of the Apostle or in his abrupt and stern denunciations of certain unnamed errorists against whom he warns the Philippians. Their false doctrine seems to have been at least remotely akin to that of the Judaizers whom he had combated in the Epistles to the Galatians and the Romans, possibly still more closely to that of the nameless faction condemned in Second Corinthians. The occasion of this letter was gratitude for the once more repeated gifts of the Philippian Christians toward his support, and its tone throughout is that of joy. Even when he speaks of his own privations, his expressions are in harmony with his injunction, "Rejoice in the Lord alway; again I will say, rejoice."

The Epistle to the Colossians is apparently, like that to the Romans, addressed to a church which Paul did not found and had never visited, though its existence was probably due to the radiating influence of his long work at Ephesus, the metropolis of western Asia Minor. Epaphras, presumably the founder of the Colossian church, had visited Paul in his Roman imprisonment, and we may well suppose that it was from him that Paul had learned the effect on Christian faith and life which the teaching of certain errorists was having. It is hard from the statements of the Epistle to deduce with certainty the exact nature of the views combated, but the errors seems to have been both speculative and practical. While on the one hand they involved an asceticism in closest harmony with the practices of the Jewish Essenes, on the speculative side they anticipated to some extent the developments of later Gnosticism. To meet this false philosophy a true conception of the place of Christ and of his relation to the universe was needed; so the dominant note of the Epistle is the sole and supreme greatness of Christ, who by His unity alike with God and men obviates the necessity of angelic mediators and even precludes the possibility of their activity. This conception consistently carried out cuts the ground from under false asceticism and every form of mere legalism, and no less requires and ensures the highest type of personal and social morality.

The sister epistle, to the Ephesians, includes a surprising number of the same thoughts and words, but they are used with a complete lack of all apparent imitation to bring out a wholly different general idea. While here, too, Christ is exalted, the main thought is the oneness of all Christians, that the work of Christ results in the removal of all barriers that separate men, notably of the hedge of the Mosaic law which had divided Jews and Gentiles. It has been plausibly held by many that the destination of this letter was a wider circle of readers than the single church at Ephesus, it being a circular letter to all the churches in the region, of which circle the churches at Ephesus and Laodicea would be positively known to us. On the one hand we know from Colossians that a letter was simultaneously dispatched to the Laodiceans; on the other, doubt is cast on the present address, "In Ephesus," by a little but weighty evidence for its omission. Further that no personal salutations are added is somewhat surprising when we remember how long Paul had worked at Ephesus, but natural if the letter was equally intended for other churches, and the conception of Christian unity which dominates the Epistle is admirably fitted to be the theme of a circular letter. This hypothesis, while not to be regarded as already proved, if, indeed, ever provable, seems well to suit the conditions of the case, and in some respects the Epistle gains in significance when thus regarded.

Another epistle, certainly dispatched with that to the Colossians, is the letter to Philemon, who was, as we infer, a well-to-do Christian residing at Colossæ. One of his slaves, Onesimus by name, had run away, stealing as he left, and in far away Rome had come under the influence of the same Paul under whose influence his master, Philemon, had earlier been converted. Paul had found the fugitive slave, now a changed man, to be very useful for service to himself, but unselfishly sent him home with a letter intended and admirably adapted to secure pardon and favor from his master, who is even bidden to treat him as a loved brother. This brief letter is not only a delightful bit of self-revelation on the part of Paul, but was arranged with consummate tact to secure its purpose.

The three epistles, two to Timothy and one to Titus, usually called from the subjects which they chiefly treat the Pastoral Epistles, agree very closely in style, in matter, in the ecclesiastical conditions pictured, and, finally, in the fact that their composition must, in the practically unanimous judgment of scholars, stand outside the life of Paul as presented in Acts. If not genuine, their occasion and purpose and the time and place of their composition must remain a matter of unsupported conjecture. If they are authentic works of the Apostle, Paul must have been released from his first imprisonment at Rome, and have traveled widely in the further course of his missionary work, although no record of it is preserved outside these letters. During this period of his life he must have made the visit to Spain, which he purposed when he wrote to the Romans, and of which some tradition remained in the churches; he made a tour in Crete; he again visited Miletus, if not Ephesus as well; he found his way to Troas and Corinth and we know not how many other such cities, and he expected to spend a winter in Nicopolis. Probably before he reached Nicopolis he was arrested, taken again to Rome, had a preliminary hearing of his case, and with the expectation of a dreary winter in a chill dungeon he wrote to his beloved Timothy to come if possible before winter and to bring with him a cloak and some parchments which had been left at Troas. From uncertain points on this route from Rome to Rome again letters had been dispatched to Timothy at Ephesus and Titus in Crete, perhaps the former from Macedonia, the latter from Corinth. These letters agree closely: in each Paul gives to the man addressed a certificate of appointment and authority, really intended to influence the churches over whom each was set and quite likely useful, not to say necessary, for that purpose; gives directions as to church life and administration; gives serious warnings against a type of error which is not clearly defined, but seems a jumble of pagan philosophy and Jewish fable, not unlike the Colossian heresy. While in these letters there is more of restraint than was common to the Apostle, a fact which their semi-official character may explain, in the second letter to Timothy, in point of date the last attributed to him, he poured out his very heart in expressions of personal sentiment and Christian experience and assurance, so tender, so strong, so fitting that from many critics who reject the most part of the Pastoral Epistles as interpolation or forgery of a much later date, these words at least have forced a recognition of themselves as of necessity genuinely Pauline.

Taken as a whole, no more remarkable series of letters has ever been penned than the Pauline Epistles. They have too often been regarded merely from the dogmatic and critical standpoint. Whatever the significance of the critical discussions for which they furnish large material, however rightly they have been considered important and profound, even inspired and authoritative statements of theological and ethical truths, beyond these they are personal communications of a great soul to those whom he trusted, sometimes his beloved friends, and as such also they should be regarded. In them the practical leader, the profound thinker, the religious enthusiast, the friend sympathetic with others and himself hungry for sympathy, uncaps his very soul, and lets us see all his thoughts in their making, hear the sob of his often lonely and disappointed spirit, count his heart-throbs, as it were; and none ever better stood the test of such intimacy. Beside their worth to criticism and theology these letters greatly serve psychology and the study of Christian experience; beside being historical sources and canonical Scriptures, they are also personal documents, invaluable to literature and life.

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Paul’; Lightfoot, ‘Biblical Essays’; McGiffert, ‘The Apostolic Age’; Ramsey, ‘The Church in the Roman Empire’; ‘Paul the Traveler and Roman Citizen’; Shaw, ‘The Pauline Epistles’; var Manen, ‘Paulus.’

See ANTIOCH; CANON; CORINTH; EPHESUS; GALATIA; ROME; SAINT PAUL; SAINT PETER; SALONICA; TIMOTHY. See also the articles on the New Testament books mentioned at the beginning of this article.

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PAULINUS, Pontius Meropius Anicius, Saint, ecclesiastical writer: b. Bordeaux, 353: d. Nola, 431. He was consul at Rome and later prefect of the province of Campania. He married a very wealthy Spanish lady, Therosia, and became a man of very considerable note. Through the efforts of Ambrose he was induced to accept the Christian faith; upon which he distributed his wealth among the poor; and though he remained in Spain he gave up his political offices and finally he was ordained a priest in 393 at Barcelona, after which he went to Rome. In 394 he retired from the world and lived as an ascetic at Nola, of which he was elected bishop in 409, a position he retained until his death. He was present at the Council of Ravenna (419); and his name frequently occurs in the letters of Augustine and Jerome. He is best known as Paulinus of Nola. His festival is celebrated on 22 June. Many hymns and letters were left by him and have been collected by Muratori and Migne. Consult Buse, ‘Paulin, Bischof von Nola, und seine Zeit’ (1856); Lagrange, ‘Saint Paulin de Nole’ (Paris 1882); Reinelt, ‘Studien über die Briefe des heiligen Paulin von Nola’ (Breslau 1904).

PAULINUS OF YORK, Saint, an ecclesiastic of the 7th century, first archbishop of York: d. 10 Oct. 644. He was sent by Pope Gregory I in 601 to England where he labored under Augustine in the evangelization of Kent. By him he was consecrated bishop in 625, when he accompanied Ethelburga on her marriage to the heathen Edwin, king of Northumbria. For a long time he made no progress in his mission beyond baptizing the infant princess; but at length Edwin and his court submitted to baptism at York, in a wooden chapel dedicated to Saint Peter, the foundation of the minster, Easter Sunday, 627. Paulinus now carried the Gospel over Northumbria, but after six years' constant labor the death of Edwin in battle at Hatfield put a sudden end to his work, and he was obliged to flee before the Northumbrians. He went back with the widowed queen to Kent. In the same year he received the “pallium” as archbishop of York from Rome; but he never returned. In the meantime he was made bishop of Rochester; and there he died and was buried in the chapter-house. Consult Bright, W., ‘Early English Church History’ (Oxford 1888); Plummer, A., ‘The Churches in Britain before A.D. 1000’ (Vol. I, London 1911); Williams, H., ‘Christianity in Early Britain’ (Oxford 1912); ‘Cambridge Mediæval History’ (Vol. II, New York 1912).

PAULISTS, or PAULIST FATHERS, the name familiarly given to the “Congregation of the Missionary Priests of Saint Paul the Apostle.” This body of priests, the sole religious congregation of clerics which is of American origin, was founded in 1858. A short time prior to this date, five American converts to Catholicism had joined the Redemptorist Order, and were actively engaged in preaching missions throughout the United States. These men were Isaac Hecker (q.v.), sprung of German Lutheran stock, and, a short time before his submission to the Catholic Church, a member of the Brook Farm community of “Transcendentalists”; Clarence Walworth and Francis Baker, both former Episcopalian ministers; George Deshon, a classmate of General Grant at West Point, and Augustine Hewitt, who, reared in New England Congregationalism, had afterward joined the Episcopalian Church. The experience of these men in their priestly work, and their intimate knowledge of American conditions, convinced them that the Redemptorist Order, to which they belonged, would not adequately meet its opportunities in this country, unless it attracted a greater number of American subjects, and became more at home in the language and national characteristics of the people. At that time nearly all the Redemptorists working in the United States were Germans. The five converts earnestly advocated the establishment of a house to serve as the headquarters of the English-speaking members, which, with English as the language in common use, might help to attract a larger number of American recruits, so much needed in the missionary field. Both Archbishop Hughes of New York and Bishop Bayley of Newark heartily supported this project. The German members of the order looked upon it with disfavor. According to the constitutions of the order, any member, if in conscience he deemed it necessary, enjoyed the right of personally laying any important question before the superior-general in Rome, without the permission of the local superiors. In 1855 a general chapter of the order had voted to abrogate this article of the constitutions. This decision, however, had not yet been approved by the Pope, and consequently was not yet definitively settled. The rector major, or superior-general, had, however, ventured to anticipate the action of the Holy See, so far as to issue a circular letter prohibiting, under pain of expulsion, any American Redemptorist from leaving America without express permission. The five American Fathers taking their stand upon their constitutional right, delegated Father Hecker to go to Rome to lay before the authorities the project of establishing an English-speaking house. Furnished with highly creditable testimonials as to his exemplary life from his provincial superior, Father Hecker sailed from New York, and arrived in Rome on 26 Aug. 1857. He was met by his superior with a decree of expulsion from the Redemptorist Order. Upheld by his confrères in America, whom he represented, Father Hecker appealed to the Propaganda; and after some delay, he was at length vindicated by Pius IX, who gave to him and the other American Redemptorists advice and encouragement to found a new missionary community.

With an enthusiasm which has ever since characterized their congregation, the five priests entered upon their new vocation under the patronage of Saint Paul. Their twofold purpose — a purpose incorporated in their constitutions, and held before every Paulist as his ideal — was personal perfection and zeal for souls outside the Catholic faith. Lovers of America, and deeply penetrated with the national spirit, it was natural that they should lay special stress upon the cultivation of personal initiative, spiritual liberty, a high sense of honor and duty and the virtues of fortitude and fidelity. Hence, it is a characteristic of the Paulists, the followers of Father Hecker, to aim at the highest possible legitimate development of the individual, interfering with him only to the extent dictated by the common good and the requirements of conventual discipline. It is in keeping with this spiritual scheme that, while the Paulists do not take the usual vows of religious orders, they live the life of the vows in strictness. This interior spirit of the congregation has been widely misunderstood; it must be appreciated correctly, if one is to form a just judgment of the institute and of its founder. The absence of vows is not an indication that the Paulists wish to exempt themselves from any burden of the religious life; for, even had they solemn vows they would be no more devoted to the evangelical counsels than they are at present. But, without vows, to live as though solemnly vowed, implies a spirit of individual conviction of enthusiasm and of free consecration which best harmonizes with the interior and exterior vocation to which the Paulists devote themselves.

In carrying out their chosen work, the Paulists, though few in number, have left a clearly defined impress upon the course of the Catholic Church in America. It is chiefly due to them that a systematic and persistent endeavor to bring non-Catholics into the Church is now extensively organized among the diocesan clergy. Their example is stimulating other religious societies to fraternal emulation. In missionary work of this kind the Paulists are uncompromising in presenting the doctrines and claims of Catholicity, while, at the same time, they carefully avoid the polemical attitude which only arouses and exasperates religious prejudice. Another work in which they stand in the foremost rank is the promotion of temperance. Exhortation to total abstinence is a characteristic of their mission preaching; and their printing-house in New York is the headquarters of the publication bureau of the Catholic Total Abstinence Society. The propaganda of the press was an early ambition of the Paulists. In 1865 they founded *The Catholic World*, a monthly magazine; in 1870 they established for young readers a bi-weekly, *The Young Catholic*, which is now a monthly under the name of *The Leader*; in 1896 they began to issue a quarterly, entitled, *The Missionary*, which serves as the organ of the non-Catholic missions. Besides these periodicals, their presses turn out, annually, hundreds of thousands of pages of devotional, homiletic and apologetic literature. Another feature of Paulist endeavor has been the observance, in public worship, of strict ceremonial, including only Gregorian music, highly developed in their imposing basilica at 59th street and 9th avenue, New York City. Recent figures give the number of Paulist Fathers as 64. They have missionary houses in New York, San Francisco, Winchester, Tenn., Chicago, Austin, Tex., and Portland, Ore.; and a house of studies at the Catholic University, in Washington, D. C. Consult Hewit, N. A., 'Memoir of the Life of Francis A. Baker' (7th ed., New York 1889); Elliott, W., 'Life of Father Hecker' (New York 1899).

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PAULITES, or HERMITS OF SAINT PAUL, an obscure religious order of men who take Saint Paul, the first hermit, as their patron. The order was established in 1250 by uniting the Hermits of Saint Augustine with those who lived under the rule of Saint Eusebius of Grau, who became the first superior of the new organization. They now follow the rule of Saint Augustine. They are found in Italy, France, Spain, Germany and other countries. They usually wear a short cloak and cowl and go barefooted. They also wear a beard. There were various orders of Paulites. The earliest of these is believed to have had its origin in Hungary on the date above indicated. The order spread with considerable rapidity throughout northern Europe; and it attained to a strong position of influence in Hungary where it counted 170 cloisters. But owing to the fact that the order was involved in political intrigue most of its houses were suppressed in the 18th century; but a few still exist to-day in Poland. About 1420 the Paulites entered Portugal; but were suppressed about 150 years later. In France, the Paulites, popularly known as the «Brothers of Death» had a short life (1620–33). The «Blind Sisters of Saint Paul» is an order founded in Paris in 1852, to assist blind women and children; and the Sisters of Saint Paul of Chartres (Hospitalers of Chartres) appeared in the latter part of the 18th century with the avowed object of taking care of the sick and poor. Consult Currier, 'Religious Orders.'

PAULO AFFONSO, pow'lō ăf-fŏn'so, **Falls of.** See São Francisco.

PAULOWNIA, a genus of ornamental trees of the family *Scrophulariaceæ*. The species, of which three have been described, are natives of Japan and China. The best-known species (*P. tomentosa*) is catalpa-like in habit of growth, having stout, spreading branches and flowers in terminal panicles. The flowers, however, are bell-shaped and the fruits two-celled capsules instead of long pods. In favorable climates the trees become 40 feet in height; in cold localities they are often killed to the ground by frost, but send up numerous sprouts from the stump. At Montreal they are often planted for screens or specimens on lawns, their rapid growth, often amounting to more than 12 feet in a season, and their striking foliage (leaves frequently a foot wide and two feet long), making them very interesting. At New York City the tree is hardy but its blossom buds are frequently killed by the winter. In this species the flowers resemble those of foxglove, are violet in color and fragrant. They appear in great profusion in April or May. An evergreen species has recently been discovered in southern China, and is said to be one of the grandest of floral spectacles when in blossom.

PAULS VALLEY, Okla., city and county-seat of Garvin County, situated on the Washita

River, the Gulf, Colorado and Santa Fé and the Atchison, Topeka and Santa Fé railroads, 55 miles south of the city of Oklahoma. A State training school for boys is located here and there are cotton compresses and a bit and spur manufactory. The municipality owns the waterworks. Pop. 2,689.

PAULSEN, powl'sĕn, **Friedrich,** German philosopher: b. Langenhorn, Schleswig, 16 July 1846; d. 14 Aug. 1908. He was educated at Erlangen, Bonn and Berlin, became a lecturer at the University of Berlin in 1875, and professor of philosophy and pedagogics there in 1873. Paulsen was a Kantian, and found in that philosophy the basis for the philosophic thought of the future. He held that Kant showed knowledge to be limited to the facts derived from the observation of the relations of phenomena in time and space. The power of value (or the good) is not demonstrable by science, but must be entrusted to faith. But science proves that there exists no scientific impossibility in belief in the indestructibility of that which possesses worth, of the freedom demanded by the will and of a world beyond the reach of sense. Faith is in no danger of a real attack from science, but science may remove obstacles from the way of faith. The empirical view of the world remains incomplete and valid for only restricted human observation. Among Paulsen's more important works are 'Entwicklunggeschichte der Kantischen Erkenntnisstheorie' (1875); 'Gründung, Organization und Lebensordnung der deutschen Universitäten im Mittelalter' (1881); 'Geschichte des gelehrten Unterrichts auf den deutschen Schulen und Universitäten' (1885); 'Realgymnasium und humanistiche Bildung' (1889); 'Ethik' (1889); 'Einleitung in die Philosophie' (1892; Eng. trans. 1895), a work of high literary as well as philosophic value; 'Immanuel Kant' (1898); 'Kant, der Philosoph des Protestantismus' (1899); 'Schopenhauer, Hamlet and Mephistopheles' (1900); and 'Philosophia Militans' (1900; 2d ed., 1901), containing a vigorous reply to the 'Welträtsel of Ernst Haeckel; 'Das deutsche Bildungwesen in seine geschichtlichen Entwickelung' (1906); the same translated into English (1908); 'Richtlinien der Jüngsten Bewegung im höheren Schulwesen Deutschlands' (1909).

PAULUS, pow'loos, **Heinrich Eberhardt Gottlob,** German theologian: b. Leonburg, near Stuttgart, Würtemberg, 1 Sept. 1761; d. Heidelberg, Germany, 10 Aug. 1851. He studied in Tübingen, Göttingen, London and Paris, making a specialty of Oriental languages and theology; in 1789 he was called to the chair of Oriental languages at Jena and in 1793 took the chair of theology in that institution which he filled until 1803 when he accepted the same professorship at Würzburg. In 1808 he became director of the department of public worship at Bamberg, at Nuremberg in 1809 and in 1811 at Ansbach. In that year he accepted the professorship of church history at Heidelberg. Paulus was an earnest exponent of rationalistic theology. Among his best-known books are 'Life of Jesus as the Foundation of an Original Work on Christianity' (1828); 'An Exegetical Handbook of the Three First Evangels' (1830).

PAULUS, pâ'lŭs, **Julius,** Roman jurist of the latter part of the 2d and the first part of the 3d centuries A.D. He was a legal assessor under the emperor Septimius Severus, was exiled by Elegabalus, was recalled and became prætorian prefect under Alexander Severus. He wrote much. His commentaries on the civil law covered 16 books; and those on the prætorian (equity) law 78 books. In addition to this vast amount of legal work, he published 48 books of 'Questions' and 'Answers' and many articles on a variety of other subjects. His 'Sententiæ' (in five books) presents, in a readable and succinct form, the entire civil and prætorian law. His 'Institutes' for beginners was long a favorite among students of Roman law. More than one-sixth of the Digest of Justinian is taken from Paulus. Consult Huschke, 'Jurusprudentiæ antejustinianeæ quæ supersunt' (Leipzig 1879).

PAULUS ÆGINETA, ĕj-ĭ-nē'tạ, or **PAUL OF ÆGINA,** Greek medical writer, probably belonging to the latter part of the 7th century A.D. His encyclopedic work, 'Artis Medicæ Principes,' translated into English in three volumes (1844–47), shows great erudition and good judgment, and is noteworthy for its information on early surgery. Paul was in high repute with the Arabians, who called him Al-Kawâbeli, the Gynæcologist, and translated his 'Principes' into Arabian.

PAULUS DIACONUS, dĭ-ăk'ō-nŭs, «Paul the Deacon,» also called **WARNIFRIDUS,** and **PAULUS MONACHUS,** «Paul the Monk,» the earliest of mediæval historians: b. Friuli, about 720; d. about 800. He was educated in the court of the Lombard kings at Pavia. On the capture of Desiderius, the last king of the Lombards, by Charlemagne, he retired to the monastery of Monte Casino, where he took the cowl. In 781 he was called to the court of Charlemagne. Paulus drew up a book of homilies from the Fathers, which was in general use throughout Europe during the Middle Ages. He also wrote a history of the bishops of Metz, 'Gesta Episcoporum Metensium,' which is to be found in the second volume of Pertz's 'Monumenta Germaniæ Historica.' In 787 he returned to his monastery at Monte Casino and spent the rest of his life in religious and literary labors. Here he wrote his history of the Lombards, 'De Gestis Langobardorum Libri VI,' his principal work. It is written in a lucid and elegant style, is prized for its general truthfulness and contains a mass of information elsewhere unobtainable. It commences with the migration of the Lombards from Scandinavia to the death of King Liutprand. The best edition is contained in Muratori's 'Rerum Italicarum Scriptores.' It is interesting and, in a sense, quite remarkable for the number of legends it contains, all of them poetical, and all relative to the early Germans. Paulus was also a writer of hymns and the author of numerous theological works, popular in their day. His history of the Lombards was translated into German by Reinhardt Jacobi and published in Leipzig in 1888 and an English translation was made by W. D. Foulke, who attached thereto good notes and biography (Philadelphia 1907).

PAULUS HOOK, formerly the name of the site of Jersey City, N. J., where fortifications were constructed by the Americans in 1776. The works were captured by the British in September of the same year, but on 19 Aug. 1779 a party of American soldiers, under Lieut.-Col. Henry Lee (q.v.), retook and partially destroyed them. The British garrison was surprised and 159 prisoners were taken, with an American loss of two killed, three wounded. Paulus Hook was again reduced by the British, who held it until the end of the Revolution. The feat of Lee and his men was commemorated 21 Nov. 1903 by the dedication of a monument on the Paulus Hook battleground. The memorial, erected under the auspices of the Daughters of the American Revolution, is a rough-hewn granite shaft standing in the middle of a public square in Jersey City, and within the lines of the old fortification. An interesting feature of the dedication was the oration delivered by Gen. Fitzhugh Lee of Virginia, a grandson of «Light Horse Harry.»

PAUMOTA, pä-oo-mō'tä, or **PAUMOTU**, pä-oo-mō'too, native name for the Low Archipelago, a group of islands in the south Pacific. See TUAMOTU ISLANDS.

PAUNCEFOTE, Julian, LORD, English diplomat: b. Munich, Germany, 13 Sept. 1828; d. Washington, D. C., 24 May 1902. He was educated at Marlborough College and in Paris and Geneva. He began the practice of law in 1852, was, for a time, secretary to the colonial minister, Sir Samuel Molesworth, and in 1862 went to Hongkong where he practised law and became attorney-general in 1865. In 1872 he became chief justice of the Leeward Islands, in 1876 legal assistant under-secretary at the Foreign Office, and in 1882 permanent Under-Secretary of State for Foreign Affairs. In 1889 he was appointed Minister to the United States, and 1893, when the office of Ambassador was created, he was first to present his credentials as Ambassador. His marked diplomatic ability and evident friendliness toward this country did much to bring about cordial relations between England and the United States. In 1890 he accepted the principle of arbitration for the Bering Sea dispute and in 1892 signed the treaty. He managed the Venezuelan dispute skilfully, and negotiated a general arbitration treaty between Great Britain and the United States which was rejected by the Senate. He was most earnest in his efforts to abrogate the Clayton-Bulwer Treaty and negotiated and signed the treaty which supplanted it. (See HAY-PAUNCEFOTE TREATY). He was British delegate to The Hague Peace Conference in 1899 and was raised to the peerage as Baron Pauncefote of Preston in recognition of his services there.

PAUPERISM, (from Lat. *pauper*, poor). The word, strictly speaking, applies not to temporary destitution, not at all to «honest poverty,» but to chronic willing dependency. It is applicable to those who are partly supported by charity, as well as those wholly thus supported, if the condition is chronic. Destitution arising from such misfortunes as sickness or the death of the family bread-winner, is usually a curable condition, and does not often sink into pauperism except through the maladministration of relief, as when more is paid to the beggar than he could possibly earn, so confirming him in his degrading habit, and tempting his neighbors to give up their hard work and strike for the easier task and higher wages of beggary. The history of pauperism is, for the most part, a history of the successive mistakes in poor relief of over-zealous humanitarianism and unwise charity.

Early History.— Imperial Rome presents the first notable instance of pauperizing by undue aid. Ambitious politicians gave free grain, not to the wounded and helpless, as Athens had done, but to all men residing in the capital who could prove themselves Roman citizens. This began when votes could thus be bought under the repubic. Julius Cæsar found one-third of a million of these able-bodied pensioners and cut the number down one-half; but Augustus allowed it to grow again. Marcus Aurelius, though a Stoic himself, gave these robust dependents bread and oil and meat. The strength of that world-conquering race was thus undermined and the demand of the beggared populace, «Bread and games,» is recognized as the death cry of once invincible Rome. With Constantine, the succession of misdirected charity passed over to the Church. While the Christian churches had been small in days of persecution they had shown, in intensified degree, the spirit of neighborly helpfulness that had existed among the Jews, whose Mosaic code is the most charitable of any ancient law. In the early Christian churches there was not much to give, and relief was seldom excessive or bestowed without due knowledge of the case. But with the patronage of the emperor there came to the Church great charitable funds to be given in a general way to applicants whose circumstances in many cases would not be known. One-fourth of the Church funds in Rome were thus devoted to the poor. Charlemagne was the first Christian ruler to take a strong hold of poverty as a civil problem. He required bishops and nobles to provide for their poor. In 779 he forbade begging and imposed a poor-tax. He also provided institutions for widows and orphans, which were not sufficiently grounded, however, to abide after his death. But religious benefactions of all sorts multiplied, many of them established as atonements for the sins of the rich donors. In the 15th century cities began to take up the problem of relief, but not of prevention or cure.

Modern Pauperism.—After the civil and social commotions in the 16th century consequent upon the Reformation efforts were made to cheapen necessities, to secure employment, to help the poor to help themselves. Public workhouses appeared before the end of the 17th century and there grew up a literature on the subject of poverty. But in the opening years of the 19th century prolonged wars again increased poverty and beggary. Germany, before the World War, showed she had learned the lessons of the past by wise administration of private and public relief, with friendly visitors, thorough investigation and discriminating aid, and especially by compulsory old age insurance, said to have put 40,000,000 of her people beyond the fear of want in their last years. The general principles as to poor-relief in all the German states, except Bavaria, are laid down by the Imperial law of 6 June 1874, amended by the law of 12 March 1894. The territory under this law is divided into local unions (*Ortsarmenverbande*) and provincial unions (*Landarmenverbande*). Usually a local union is a commune (*Gemeinde*), while a provincial union consists of a large administrative division such as a circle (*Kreis*), a province or a whole state. For the purposes of poor-relief a settlement is acquired by two years' continuous residence (after the age of 18), by marriage or by descent. A German in distress must be relieved by the local union in which he becomes destitute, and the cost must be refunded by the local union in which he has a settlement or by the appropriate provincial union. In communes poor-relief forms part of the ordinary local government business; in towns the actual administration is carried out by a special committee under the presidency of the burgher-master. Poor rates are usually not levied. In most large towns the Elberfield system of unpaid district visitors is in force. Statistics of pauperism are not published regularly; the last issue related to the year 1885.

Under an Imperial law of 1883 and amending acts (codified in 1912), workmen must be insured against sickness and must themselves pay two-thirds of the contributions, their employers paying one-third. For accident insurance, under an Act of 1884 and amending acts, the contributions are paid entirely by the employers, and they, for mutual protection, have united into associations according to the nature of the industries in which they are engaged. The working of these insurance associations is controlled by government. For invalidity and old age insurances, under an Act of 1889, amended in 1899, the contributions are paid half by the workmen and half by their employers, while toward each pension the government grants an annual subsidy of 50 shillings. The employers are responsible both for their own and the workmen's contributions, but the latter may be deducted from wages paid subsequently. Contributions are paid by the purchase of stamps from the post office; these are affixed by the contributing person to cards on which there are spaces for stamps for 52 weeks. When the contributions are complete, the card is handed in to a specified office and a certificate given in return. The old age pension is given on the completion of the 65th year (from 1916 onward) of the workman's age, contributions having been paid for 1,200 weeks (equal to about 25½ years), a margin of five weeks being allowed each year. Austria cares for her poor by communes through the priests. Belgium has almshouses and compulsory labor for able-bodied dependents. Holland has been much praised for her labor colonies and numerous organizations to relieve and remove poverty. In France the Church, save in the period of the Revolution, has had chief charge of the poor, and its best relief agencies have been the Sisters of Charity and its numerous charitable institutions, many of them founded by Francis de Sales and Vincent de Paul and others of more recent origin to meet modern needs. Under modern conditions the poor are assisted partly through public “bureaux de bienfaisance” (welfare bureaus) and partly by private and ecclesiastical charity. They are partly under the care of the communes and partly of the départments, both of which contribute, and ultimately under the supervision of government. The funds of the “bureaux de bienfaisance” are partly derived from endowments, partly from communal contributions and partly from public and private charity. In 1912, 19,366 bureaux expended $10,923,600 and assisted 1,260,000 persons excluding 92,000 persons in Paris. Public assistance is rendered to poor or destitute children. At the end of 1912 the institutions for this purpose contained 231,300 children; the expenditure during the year amounted to $8,464,250. In 1912 the hospitals for the sick, infirm, aged or infants, numbered 1,892; they contained 231,517 beds, and at the end of the year had 68,700 patients, besides 75,540 aged and infirm inmates; their expenditures for 1912 amounted to $40,881,200. In the same year 987,000 persons received gratuitous medical assistance at home and 185,000 in hospitals, the expenditures for such purposes amounting to $5,800,000. At the end of 1912 the asylums for imbeciles, national, departmental and private, had 77,237 patients.

An act was passed in 1905 for the relief of the aged poor, the infirm and the permanently incurable, age limit, 70; but by the amendment of the Act, 5 April 1910, this was reduced to 65. The same amendment provided for limited help being given to those between the ages of 65 and 70. On 31 Dec. 1912, there were 310,000 such persons in receipt of the limited assistance, the total expenditure for 1912 having been $1,837,800. The Act of 1910 provided that the cost of the scheme should be borne by the commues, the departments and the State. The number of persons registered for relief has risen from 511,446 on 31 Dec. 1908, to 599,061 on 31 Dec. 1911, and to 644,461 on 31 Dec. 1912. The cost to the State alone for 1910 was $9,600,000; for 1911, $9,920,000 and for 1912, $11,100,000. In addition, contributions of the departments and communes totaled $9,300,000 in 1911, and 10,158,600 in 1912; but it has to be remembered that the increased expenditure under this law is in part balanced by the diminished activities of the “bureaux de bienfaisance” in assisting invalids under 60 years of age. The Old-Age Pensions Law of 5 April 1910, as amended on 27 Feb. 1912, provides for all wage-earners old-age pensions toward which both employers and workers contribute. Contributions are to be paid up to the 60th year of the worker's life, and the State will contribute $20. This sum will be increased by one-tenth for every insured worker who has brought up three children of the age of 16. On 31 Dec. 1913 8,011,138 persons were registered under the scheme.

It is instructive to recall England's mistakes in poor relief, which are representative of Scotland, Ireland and Wales also. In 1601 a great advance was made by the enactment of the poor law of Elizabeth. Begging had been forbidden in vain in previous centuries, but by that law all able-bodied paupers were required to work, under which requirement public workhouses developed. A serious backward step came in the Speenhamland law of 1795 by which a certain standard was set up as a “living wage” and all who fell short got an “allowance” from the public treasury. This of course encouraged employers to give low wages and made workmen content to receive them. In about 40 years the nation was startled to find its relief fund had quadrupled. Parliament investigated and found they had pauperized thousands by undue aid. In 1834 reforms were instituted by which “outdoor relief” was greatly limited and able-bodied persons were made ineligible for public aid outside the poorhouses, which were made less attractive, only the plain necessities of life being provided. Nearly all except the aged and infirm were removed to special institutions provided for the deaf and dumb and other defectives and for children. A poor law, under a variety of statutes, is now applicable to the three Kingdoms, by which paupers, under certain conditions, are to be relieved in their own houses or lodged in workhouses or poorhouses built for the purpose. The law is administered by the Local Government Board, through boards of guardians elected for the purpose. England and Wales, including the metropolis and the municipal boroughs, are divided into 653 poor law unions, for each of which there is elected a board of guardians. In urban districts and in the metropolis guardians are separately elected, but in rural districts the rural district councillors act as guardians for the parishes they represent on the district council. Guardians are elected on the same popular franchise as district councillors. Women are eligible. In every civil parish overseers are appointed whose duty it is to make and collect the poor rate.

The amount expended in poor-relief for year ended 25 March for England and Ireland, and May 15 for Scotland (1913–14) was: England and Wales, $75,279,315; Scotland, $8,046,790; Ireland, $6,379,565; total United Kingdom, $89,703,670. For Scotland, the amount includes expenditure on buildings and loans repaid and interest.

Under the Old Age Pension Acts, 1908 and 1911, every person over 70 years of age who is a British subject; who for 12 out of the 20 years up to the date of receiving a pension has resided in the United Kingdom (residence abroad is allowed to count in certain circumstances); and whose yearly means do not exceed $157.50, is entitled to a pension; provided he has not through idleness habitually failed to maintain himself and his dependents, is not in receipt of poor-relief (except medical and certain other kinds of relief), is not a lunatic in an asylum, has not been a convict in prison during the preceding 10 years for a term of upwards of six weeks, or during the preceding two years for a term not exceeding six weeks, and is not disqualified by order of a court.

Under the National Insurance Acts, 1911 to 1916, also, provision is made for compulsory insurance against loss of health, for the prevention and cure of sickness and for compulsory insurance against unemployment.

In America.— In the United States, from early times, every town in New England, every county elsewhere, has had its poorhouse, where at first all kinds of dependents and defectives and many delinquents were herded together. In recent years they have been sorted out leaving in the poorhouses, as stated above for England, few except aged and infirm adults. Some American cities have made the mistake of too generous outdoor relief, by which, at certain times, one-tenth of the population of such rich cities as Chicago and Brooklyn have been tempted to become wholly or partially dependent. Charity organization societies by their teaching and the co-operation they have secured among the administrators of relief have largely reduced this evil and other abuses of charity.

Statistics.— The census of 1910 reported an almshouse population in the United States numbering 84,198, of whom 57,049 were males and 27,149 females. Among this number were 2,486 children under 16 years of age. Of the whole number 42.6 per cent were foreign born and 57.4 per cent native born, including 7.5 per cent negroes. Of the foreign born the Irish were in largest proportion, with the Swiss next. Italy had the smallest proportional representation and Russia the next smallest. Regarding ages, 34.7 per cent were under 55 years; 34.2 per cent were between 55 and 69 years; and 31.1 per cent were 70 and older. Nearly one-third of the entire number had been in the almshouses less than one year and were there temporarily to tide over a period of special stress. About two-thirds of them were either physically or mentally deficient. The men were principally unskilled laborers, but there was a comparatively large percentage of farm and agricultural laborers, and a considerable number of skilled laborers — carpenters, painters, glaziers, varnishers, etc. The females were mostly of the domestic service class.

During the year 1910, 88,313 persons were admitted to the almshouses of the country; 17,486 died; and 59,110 were discharged. Of this last number about two-thirds had been inmates for less than a year. Three-fourths of those discharged returned again to the ranks of the self-supporting and the remainder were taken into the homes of relatives and friends.

The highest ratios to population of the almshouse paupers were in New Hampshire, Connecticut and California, in the order named. In New Mexico there were no almshouses and in Oklahoma very few. Louisiana, Wyoming and North Dakota were notable for their very low proportions. The number for the whole country averaged 91.5 per 100,000 of population. The ratio for New England was 181.4 per 100,000 and for the West South Central section (Arkansas, Louisiana, Oklahoma and Texas), it was but 18.6.

The statistics of charitable institutions aid in throwing light upon the extent of aid given regularly to the deserving poor. The average of such institutions in the United States in 1910 was 444 per 100,000 of the population and the average number of persons succored annually by each institution, 5,872. The total number receiving such aid in 1910 was 5,409,556 and the amount expended was $111,498,155. In the Middle Atlantic section, the amount expended was an average of $2.35 for each inhabitant; in the West South Central section it was 29 cents. No parallel can be drawn from such figures, for they exhibit only the aid given and not the need. It is to be said also that a very large sum of money is used in succoring the needy which does not pass through the treasuries of the benevolent societies and for which there is no accounting. The poorhouses in any case contain less than half of the chronic dependents, since there is among the poor a great dread of the "poorhouse," that inclines many who would in other days have gone there to become tramps instead and live by doles of food and clothes and money and by petty thieving, while there are also in every community many drunken and vicious persons who live altogether on the easy benevolence of others, besides a great number of widows and children supported regularly by relatives and by churches, not a few of these weakened by too much help until they willingly receive and even expect and ask, if not demand, what they could by earnest effort get on without. A city officer of Cleveland, in 1903, estimated that one-tenth of that prosperous city in that prosperous year received charitable aid. Dependents have been classified as (1) absolute dependents; (2) temporary dependents; (3) paupers; (4) temporary dependents likely to become paupers. In the first class have been placed the aged, children, the crippled, the incurables, the feeble-minded, the blind, the deaf-mutes and the insane. In the second class the unemployed and widows with young children. In the third class professional beggars, tramps, degenerates. In the fourth class the sick and convalescents, the tuberculous, the inebriates and the drug habitués. Each of these classes requires different treatment and the foundation of all reform must lie in the restoration of self-respect in those who have abandoned it and the fostering of it in those likely to lose it.

Tramps.— The American poorhouse, with its few old and infirm inmates, and street begging in American cities, which is everywhere forbidden, but almost everywhere tolerated to some degree by public officers and private citizens, are the smallest part of the present American problem of pauperism, which is chiefly concerned with able-bodied «tramps,» a term properly applied to those whose beggary is not localized but nationalized by constant travel from place to place. There are thousands who are tramps by choice, who tramp and beg rather than work even in the most prosperous times, especially in summer, when they can sleep out of doors without serious discomfort. Usually they ask for work, to evade the law against begging, knowing very well that most persons will give them food or clothes or money to get them out of the way in a hurry, lest they steal or do some act of violence or revenge. The tramps know also that town authorities will usually give them free lodging in station-houses for a few nights each and that even if they are arrested, rather than bear the expense of supporting them in jail for vagrancy, they will order them to «move on,» sometimes even paying their fare to the next town. Stealing rides on freight trains is their common practice. They are gregarious and camp together in the outskirts of towns, going from these camps singly to their house-to-house begging. The chief cause of pauperism, other than careless alms-giving, are the vices that waste both the purse and the person. Sensuality weakens mind and body and destroys self-respect and thus leads straight to chronic dependency.

Cures.— The Charity Organization Society of New York reports that from 43 to 52 per cent of all applicants need work rather than succor. The approved cures of pauperism, in distinction from wise administration of temporary charity (see CHARITY), are: 1. A strong public sentiment against giving to unknown beggars. 2. Enforcement of laws against begging. 3. Philanthropic workyards where men out of work can be temporarily sent while hunting a new job. 4. Self-supporting loan bureaus, managed by philanthropists, where goods can be safely pawned at moderate interest. 5. Farm colonies, to which the city poor can be sent to work in company with others, avoiding the dreaded loneliness of ordinary farm life. 6. Friendly visitors and social settlements, by which the strong can give themselves upliftingly to the weak, in recognition that «the lack of goods for the higher wants is not so bad as the lack of wants of the higher goods.» 7. Tenement-house reform. 8. Old age pensions. (See OLD-AGE INSURANCE AND PENSIONS). 9. Public and private efforts to protect the children of the poor, by proper child labor laws and compulsory education laws, in their right to health, education and a favorable environment.

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PAUSANIAS, Greek topographical writer of the 2d century A.D. His 'Hellados Periegesis' in 10 books is an itinerary of his extensive travels. Pausanias visited all the most important places in Greece. He describes Attica, Megaris, Corinthia, Sicyonia, Laconia, Messenia, Elis and Olympia, Achæa, Arcadia, Bœotia, Phocis and Lacedæmon. His observation is accurate, and his descriptions simple and practical. His work has been edited by Siebolis (1822); L. Dindorf (1845); Spiro (1893). The edition by Clavier and other (1814–23) contains text, French translation and notes. J. G. Frazier's 'Pausanias' Description of Greece,' is the standard English translation (1898). Consult the valuable partial commentary in Harrison and Verrall, 'Mythology and Monuments of Ancient Athens' (1890).

PAUSILIPPO, pow-sē-lē'pō. See POSILIPO.

PAUWELLS, pow'ĕls, **Ferdinand,** Belgian historical painter: b. near Antwerp, 13 April 1830; d. 1914. He attended the academy at Antwerp (1842–50) and attained pre-eminent skill as a colorist under the instruction of Mapper, who represented the newest school of Belgian painters. His first picture of importance, 'Baldwin I and His Daughter Johanna' (1851), was followed by 'Coriolanus of Rome,' which latter obtained for him the «Prix de Rome.» After an absence of four years in Italy he exhibited 'Deborah, the Prophetess'; 'Rispah, Saul's Concubine, by the Corpse of her Son' (1856). His reputation reached its height during his residence at Antwerp, where he painted 'The Widow of Jacob van Artevelde' (1857), which is in the Brussels Museum; 'Banished by Alva' (1861); 'The Call of Saint Clara' (1861); and other striking works. He became professor in the Art Academy at Weimar in 1862 and had a large following among the students. In 1876 he became professor in the Academy of Painting at Dresden. In the meantime he painted numerous historical pictures, among them 'Queen Philippina Ministering to the Poor in

Ghent'; 'Louis XIV Receiving the Deputation of the Genovese Republic'; and seven wall pictures illustrating the life of Luther. Among his later works are 'Count Philip of Alsace Visiting a Hospital in Ypres' (1877); 'Admonition' (Leipzig Museum 1879). Dramatic energy and power of facial expression, grandeur of style and brilliancy of coloring are the qualities of this artist who has had considerable influence upon modern painting. Yet he lacks power to express depth of feeling and strong characterization so noticeable in the greatest of the older masters.

PAVANE, an ancient Italian dance, popular during the 16th century. It was adopted in Spain, France, England and Scotland and was a favorite pastime in court circles. It was a solemn, stately dance, sometimes accompanied by a song.

PAVEMENT ANT, the small black ant (*Tetramorium cespitum*) which has long been naturalized from Europe, locating especially in the neighborhood of New York City, Philadelphia and Washington, D. C. It commonly makes its nests in galleries under the pavements of garden paths and village sidewalks. These galleries may be destroyed by kerosene oil or by boiling water. It occasionally has been noticed as storing grass seeds in granaries. In Europe it practises many interesting customs, entertaining idle ants of other weaker species, and sometimes deposing its own queens in favor of those of another race. See ANT. Consult Wheeler, W. M., 'Ants: Their Structure and Behavior' (New York 1910).

PAVEMENTS, the surfacing laid on a street or road to keep it in a condition capable of sustaining traffic. Pavements have been a leading feature of civilization in all historic ages, and their absence is evidence of a low degree of progress, if not of decay. The Roman Empire depended almost as much on its pavements as on its armies for keeping its vast dominion knit together, and Roman roads are to-day among the most valued legacies of Roman occupation in Great Britain and on the Continent. The more important Roman roads had a paved width of 16 feet, and while their grades were not what a modern engineer would approve, they answered satisfactorily the requirements of the era in which they were constructed. The Dark Ages witnessed, among other signs of decline, the virtual disappearance of pavements, so far as public use was concerned, and it was not until a king of France was sickened to the point of vomiting by the odor of mud stirred by a passing vehicle that pavements began to be laid in Paris. The spread of epidemics in the Middle Ages was doubtless helped along by the absence of pavements. The 18th century did not show much of an advance in this respect, and the records of New York prove that streets in the very heart of the city were in a condition that in these days would be most intolerable. Paving is costly and the cities and towns of the colonial period, and for many years after, were governed with rigid and often shortsighted economy. It was not until the 19th century that paving came to be regarded as otherwise than a luxury, to be indulged in only when the demands of traffic made it cheaper to pave the streets than to flounder through mud-holes and climb over hillocks.

The necessity of street-paving is no longer a subject of discussion. It is regarded as much a requirement of settled communities as water and public lighting, and without it the enormous traffic of leading urban thoroughfares would be impossible. The only questions are as to which pavements are best, and the problem is one for the individual engineer on the individual job.

In the endeavor to secure a durable and therefore economical pavement for each particular locality, with due regard to future as well as present traffic, many kinds of resistent materials have been experimented with. Cast iron, at one time believed to be the ideal pavement, was soon discarded. The pavements now in favor include stone blocks (granite or traprock), wood blocks, vitrified brick, bituminous concrete or bitulithic, cement concrete and broken stone (Telford or Macadam).

Much of the recent advance in the art of laying pavements has been due to the study of the functions of the pavement foundation. Formerly a hard earth bottom covered with a thick layer of sharp, clean sand was the engineer's desideratum. This practice has been superseded by the cement concrete foundation laid four to 12 inches thick according to the weight of traffic to be sustained. On this any of the various pavements excepting only the broken stone may be laid. This type of foundation is generally constructed as a monolith, but sometimes the loose stone of the concrete is put in place and then grouted. In either case the surface is as carefully crowned as is the finished pavement. Concrete mixing machines make the work rapid and much less costly than formerly. The machines not only mix the material, but also deposit it anywhere in the width of an ordinary street. On wide streets two machines are used. In this way hand labor has been reduced to a minimum. The concrete foundation is allowed to set hard, which requires several days. If stone blocks or wood blocks or vitrified brick are to be used as the pavement, a layer of sand about an inch deep is spread over the foundation, just enough to bed the blocks. When the pavement is in place, fine gravel is worked into the crevices so as to fill them about one-third of their depth, and hot liquid asphalt is poured into that level. This operation is twice repeated, thus filling the crevices to the pavement level with an absolutely waterproof binder. An asphalt pavement is laid upon the same foundation, the asphalt being mixed with crushed stone and spread in a layer some six inches deep, and solidified while still hot with a steam roller. Upon this layer is spread a two-inch layer of a sandy texture and a little richer in asphalt. The bitulithic pavement differs from the ordinary asphalt type in being a true bitumen concrete. The aggregate is made up of stone of various sizes:— to quote from a recent specification: "Not more than 11 nor less than 5 per cent to pass 200-mesh; from 18 to 30 per cent to pass 40-mesh; from 25 to 55 per cent to pass 10-mesh screen; from 8 to 22 per cent to pass 4-mesh screen; not more than 10 per cent to pass the 2-mesh screen. The bitumen factor is stipulated to be at least 7 per cent and not more than 11 per cent. This pavement is also laid hot and rolled down with a heavy steam roller."

Concrete pavements are generally laid in monolithic form, a single layer the full thickness of the pavement. They are laid in sections with expansion joints between, the latter being filled with asphalt. They are also laid upon old and wornout pavements in the form of grouting. The Telford and Macadam pavements depend upon the natural binding character of broken stone packed together. There is no foundation laid for this type, the larger stone being placed at the bottom, and the pavement built up with graded smaller pieces, and the whole covered with a top-dressing of finely crushed stone. These pavements are not waterproof, as are the others described, and drainage from the bottom of the pavement must be provided for.

The estimated life of a newly laid granite block pavement is 25 years; its first cost (1914) about $3.50 per square yard; and the average cost of maintenance, 12 cents per square yard. Treated wood block pavement costs $3 to $3.50 per square yard, lasts 20 years, and costs 15 cents to 18 cents per yard to keep in repair. Vitrified brick costs $3 per square yard, lasts 15 years, and costs 24 cents a yard annually for repairs. Asphalt and bitulithic pavements cost from $2 to $2.35 per square yard, last about 18 years, and cost for annual repairs about 28 cents per yard. Telford and Macadam pavements cost about $1 per square yard, last about 10 years, and cost about 18 cents a yard for repairs for the first two or three years, and up to 50 cents a yard for the following years.

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PAVIA, pä-vē'ä, Italy, (1) a city of Lombardy, 19 miles by rail southwest of Milan, capital of a province of the same name. It is beautifully situated on the left bank of the Ticino, here crossed by a bridge of eight arches, about two miles above its confluence with the Po. The bridge, of stone and brick, is covered with a curious roof supported by 100 granite pillars. Until 1876 Pavia was surrounded by its mediæval walls, three miles in circuit, which have been replaced by handsome boulevards and public gardens. The Corso Vittorio Emanuele traverses the city centrally from south to north and contains its most important edifices, of which the chief are the cathedral, a large, heavy, unfinished structure, begun in 1486, crowned with a lofty dome and containing some good paintings, and a beautiful side chapel with the tomb of Saint Augustine; San Michele, a heavy marble edifice in the Romanesque style belonging to the latter part of the 11th century; Santa Maria del Carmine, a fine brickwork, Gothic church of imposing exterior, built in 1375, and possessed of good pictures; Santa Maria di Canepanova, in the *cinque-cento* style, by Bramante; and San Francesco, a 14th century building, with a mutilated façade of pure Italian Gothic. Other edifices deserving of notice are the Castello or Castle, erected by the Visconti, 1360–69, on the site of the old palace of the Lombard kings, now fitted up as a barrack; the municipal buildings; and several towers, once so numerous that Pavia was surnamed «the city of the hundred towers.» The university, founded, it is said, by Charlemagne in 774, is one of the oldest in Italy, and about the beginning of the 16th century was attended by about 3,000 students. It has faculties of law, philosophy, science and medicine. The buildings have several quadrangles surrounded by handsome arcades embellished with statues, busts, etc.; the library has about 136,000 volumes, and the collections include, among others, an excellent anatomical museum. There are also three colleges, a gymnasium, an ecclesiastical seminary, a school of painting, a school of design and sculpture and a municipal museum, an institute of fine arts; also a botanical garden. The public monuments include a statue of Italia and a monument of Garibaldi (1884). The chief charitable endowments are a large general hospital and a military hospital. Pavia has numerous modern industrial establishments, including iron foundries, engineering works, electric supply works, chemical works and cement factories, and it does an extensive business in wine, oil, rice, cheese, silk and fruit. About four miles north of the city is the Certosa di Pavia, an old Carthusian monastery, now classed as a «national monument,» with a magnificent Gothic church adorned with a splendid façade, among the finest decorative works of North Italy. Pavia was a place of considerable importance during the reign of Augustus. It afterward came into the possession of the Lombard kings, who made it their capital and erected many edifices, more remarkable for magnitude than taste. Near it, on 24 Feb. 1525, the Imperialists defeated the French and took their king, Francis I, prisoner. Pavia has given birth to many distinguished men, among whom were Pope John XIV and Lanfranc. Pop. about 40,000. (2) The province of Pavia, which extends on both sides of the Po, has an area of 1,288 square miles.

PAVIA, a province of Italy, in the Lombardy country. Through it run the Po, Ticino and other northern streams. The land is generally level and has long been noted for its fertility. Historically it is one of the best known districts of Italy and has been the scene of many fierce struggles. It contains an area of about 1,290 square miles and a population of over 500,000. Its capital is Pavia (q.v.). Its principal products are cattle, silk, cheese, wine, rice and oil.

PAVIA, Philippines, pueblo, province of Iloílo, island of Panay; at the junction of the Tigón and Aganan rivers, eight miles northwest of Iloílo, the provincial capital.

PAVILION, in architecture, a turret or small building, usually isolated, with a tent-like roof. The name is also applied to a projecting portion of any building having a tent roof. The term pavilion was originally applied to any light open structure with a roof or canopy so provided as to give protection. It was so called on account of its butterfly appearance. This sense of the word is also used in the name «pavilion hospitals» applied to the wings of hospitals. French architects call a prominently high, narrow portion of a building, especially if it has a high roof, a pavilion. See TENT.

PAVING. See PAVEMENTS.

PAVISE, păv'ĭs, or **PAVISOR**, in the Middle Ages, a large shield covering the entire body, and carried by a soldier for his own protection, as well as that of the archer before whom he stationed himself. The pavise was often six feet in height.

PAVLOV, a volcano of the Alaskan Peninsula in long. 160°W., with an elevation of 7,500 feet above-sea-level. Its last active period was in 1903.

PAVY'S SOLUTION, a modification of the well-known Fehling's solution for the volumetric determination of glucose and other reducing sugars, so named from Frederick William Pavy 1829–1911, the English physician-specialist, author of 'Researches on the Nature and Treatment of Diabetes' (London 1862), etc. An alkaline copper sulphate solution similar to a Fehling's solution is made to which a sufficient quantity of ammonia water is added to hold in solution all the copper when precipitated as cuprous oxide. The «end point» of the analysis is determined by the disappearance of the blue color of the solution. See FEHLING'S SOLUTION.

PAWN. See PLEDGE.

PAWNBROKERS (from «pfant,» «pawn,» a pledge, Old English), a class of small shopkeepers whose business is the loaning of money on personal pledges. In the United States and in Great Britain the business has assumed large proportions especially in the crowded sections of metropolitan cities. The usury and other abuses to which the necessities of borrowers of this class are liable has led on the Continent to the establishment of charitable institutions (see MONT-DE-PIÉTÉ), where the business is conducted on benevolent principles. In Great Britain the same plan has been tried, but it has failed. The object which has been aimed at by monts-de-piété has here been attempted to be accomplished by placing the trade under certain legal restrictions. In most Latin countries and in Latin-American nations the pawnshops thrive to a degree unknown in English-speaking countries. There the pawnshop may be said to be a national institution; and the town must be a very small one indeed if it does not possess at least one pawnshop. In all Latin-American countries pawnshops are subject to strict legal restrictions; yet they do a thriving business in opposition to the government «Montes de Piedad.» In the Middle Ages lending upon pledges was a trade almost exclusively pursued by Jews and Lombards. In France, before the establishment of monts-de-piété, the trade was regulated by law. During the Revolution the monts-de-piété were at first abolished as a monopoly, but the abuses to which the restoration of private pledging gave rise soon led to their re-establishment and the prohibition of private pledging, which is still maintained.

The common law recognizes the property of the pawner in the goods he has pledged, which cannot be forfeited by, or taken in pledge for, the debts of the pawnee, who is responsible for their safe-keeping. On the other hand, the pawnee is recognized as having a qualified property in the goods, which cannot be put in execution by a creditor of the pawner till the debt for which they are pawned is satisfied. The property of goods of which the pawner is outlawed is in the king. Perishable goods are at the risk of the pawner, if he does not redeem them in time. Goods pawned without a fixed time of redemption may be redeemed at any time within the life of the pawner. A broker who refuses to deliver goods pawned on tender of payment may be indicted. Both in Great Britain and the United States the pawnbroking business is regulated by law and in most States in this country licenses must be taken out and renewed annually. The pawnbroker is to use books and schedules as provided by law. The name and surname of the broker, together with the word «pawnbroker,» are to be put in large characters over the outer door of his shop. The information to be printed on pawn tickets must also be posted in a conspicuous part of his shop. Pawn tickets are to be given for pledges. Profits and charges are fixed by a schedule, of which the following are the principal provisions: Rate of interest on sums of $100 and under, 3 per cent per month or fraction of a month for the first six months and 2 per cent per month for the following six months; on sums over $100, the rate is 2 per cent a month for the first six months and 1 per cent a month for the second six months. The ticket is good for one year only, but can be renewed upon payment of interest. If a person offers an article in pawn without giving a satisfactory account of the way in which he became possessed of it, or attempts to redeem an article without title, he may be detained by the broker and handed over to the police to be brought before a justice and dealt with according to law. Goods entrusted to another by the owner for manufacture, repair, etc., cannot be pawned; and the owner may, on making oath that he believes a pawnbroker to have taken such goods, obtain a warrant to search his premises.

Under the law a poor person pawning a piece of jewelry valued at $20 is compelled to pay interest to the pawnbroker at the rate of $6 a year. In four years, if he requires the loan for such a length of time, he will have paid $24 interest or $4 more than the value of the loan. To relieve this condition of legal usury there was established in New York city in 1891, a Provident Loan Society, with a main office and numerous branch offices, where under a special charter loans could be made at a reduced rate of interest. The Provident Loan Society was organized by a number of New York philanthropists for the express purpose of relieving the poorer classes. Its capital was increased in 1910 to $5,000,000. The society has met with great popularity and while primarily a charitable enterprise, has been conducted at a small profit. The Provident Society rate of interest is 1 per cent a month or any fraction thereof, on small loans and 10 per cent a year on larger loans. A loan of $20 costs the borrower $2 a year as against $6 charged by the pawnbroker. The monts-de-piété of France are associated with hospitals, charity bureaus and city and town councils. The highest interest charged by them is 1 per cent a month: and in many cases, where the «mont» is endowed, little or no interest is exacted. In Belgium the French system of monts-de-piété is followed and in both countries it is illegal for private individuals to carry on a pawnbroking business. In Paris and some other large cities the "monts" act as savings banks for laboring classes.

In Germany any city may prohibit pawnshops; and many have done so. By law there are German government, municipal and private pawn shops. One of the oldest of the Imperial pawnshops of Europe is that of Vienna known as the "Imperial Pawn Shop." It was founded by Joseph I in 1707. In Russia the pawnshop business has long been in the hands of individuals; and there are only two cities in the empire, Petrograd and Moscow, which have national pawnshops. (See GOVERNMENT PAWNSHOPS IN FRANCE). Consult Levine, S. W., 'A Treatise on the Law of Pawnbroking' (New York 1911); 'The Business of Pawnbroking' (New York 1913); Tyler, R. H., 'Usury, Pawns or Pledges' (Albany 1873); 'Report of Her Majesty's Representatives Abroad on Systems of Pawnbroking in Various Countries' (London 1894); United States Bulletin of the Department of Labor, No. 21 (Washington 1899).

PAWNEE INDIANS, (the "horn-wearers," a name originating from their peculiar manner of wearing their hair), an American tribal confederacy belonging to the Caddoan family. The Pawnees called themselves "Chahiksichhiks," "Men of Men." They formerly resided in large numbers in the region now known as Nebraska, with cognate branches extending as far south as Texas. They were in constant warefare with every surrounding tribe, with the exception of the Omahas, Poncas and Otos. The Pawnees were known to the Spaniards as early as 1626 and they are noted on Marquette's map of 1673. By the ordinance of 1709 the enslavement of Negroes and Pawnees was made legal in Canada. Half a century earlier the settlers in New Mexico had already become well acquainted with the Pawnees, who frequently raided their settlements to secure horses, arms, clothing and provisions. This hostile attitude of the Pawnees continued for more than 200 years. Gradually however, they came into closer contact with the traders, who introduced among them the vices of white civilization; and when the Louisiana Purchase agreement transferred their territory to the United States, they were brought into still closer relationship with the whites in all the region lying between their home and Saint Louis, then the great Indian trading centre of the middle west. The trails to the west and to the southwest which passed through the Pawnee country helped still more to accentuate the changes which had already begun to take place in the people who continued their friendly relations with the whites, when practically all the other Indian tribes of the west were opposing the westward march of civilization. Many of them rendered good service as scouts in the United States army. Numerous treaties have been made and kept between the Pawnees and the American government. In 1818 most of the Pawnee tribes met in Saint Louis and concluded a peace with the United States and seven years later they recognized the sovereignty of the United States over themselves and their lands; and by various other subsequent treaties and agreements they gave up their right to the vast territory that they once lorded over. In 1876 the tribes finally removed to their reservation in Oklahoma where they now reside. Sixteen years later they divided up their lands *pro persona* and became American citizens.

The religion of the Pawnees was one of the most interesting of the aboriginal tribes of the United States. They were nature worshipers and they personified the winds, the storms and the elements in general, all of which were messengers and attendants of Tirawa, the great Father. Their religious observances included several series of elaborate and picturesque ceremonies all of which were in charge of a powerful priesthood. The Pawnee people were imaginative and their ceremonies, myths and folktales are rich in symbolism and imagination. They also had numerous secret societies connected with their religious rites, ceremonies and superstitions. They cultivated Indian corn, pumpkins and beans, gathered wild rice and fruit and prepared jerked buffalo and other meats for winter use. They were excellent weavers, made pottery and artistic baskets and constructed warm and durable earth houses. In 1838 the Pawnees were estimated at over 10,000, while other estimates made them over 12,000. They now number probably less than 1,000. Consult Dorsey, G. A., 'The Pawnee Mythology'; 'Traditions of the Skidi Pawnee' (1904); Dunbar, 'Pawnee Indians' (1880); Fletcher, 'The Hako' (1903); Grinnell, 'Pawnee Hero Stories' (1889); Winship, 'Coronado Expedition' (1896).

PAWNEE ROCK. A rocky bluff jutting out into the valley of Arkansas River a short distance from the village of Pawnee Rock, Kan. It is on the old Santa Fé trail and is famous for having been the scene of many encounters between the Indians and whites. The names and initials of travelers, from the early trappers to the forty-niners, are scratched on the smooth ledges of Dakota sandstone of which the rock consists.

PAWNSHOPS IN FRANCE. See GOVERNMENT PAWNSHOPS IN FRANCE.

PAWTUCKET, pâ-tŭk'ĕt, R. I., city in Providence County, on both sides of the Blackstone River, at the head of deep-water navigation on the Pawtucket River and on the New York, New Haven and Hartford Railroad, four miles north of the business centre of Providence, and about 40 miles south by west of Boston. The city is connected by electric lines with many parts of Providence and with the nearby cities and towns. A fall of 50 feet in the Blackstone River at this place, together with the rapids, furnishes extensive water power which has been instrumental in making Pawtucket an important manufacturing centre. The area is about nine square miles. Pawtucket was settled about 1654. The part of the city on the east side of the river was originally in Bristol County, Mass. In 1862 it came into possession of Rhode Island. The west part of the city was a village in the town of North Providence. In 1874 this town was divided and the "East Side" and "West Side" were incorporated as a town, and chartered as a city in 1886. The factory system of Rhode Island began April 1790, when a copartnership was established in Pawtucket for carrying on the spinning of cotton. Samuel Slater (q.v.), one of the partners, constructed a complete set of machines on which was made the first cotton thread spun by water power in the United States. The first cotton factory building, which was the first in the United States, is still standing. The chief manufactories are cotton and woolen mills, silk factories, foundries, machine shops, electrical supply works, wire works, yarn mills, hosiery mills, knit-goods factories, textile dyeing and finishing establishments, meat-packing plants, lumber mills and lumber products, factories, boot and shoe factories, jewelry works, paper and wagon and carriage factories. The city receives annually large quantities of lumber, shingles and lath, cotton, coal, building-stone, brick, lime and cement. The Federal census for 1909 gives for Pawtucket over 300 manufacturing establishments, having a combined capital of over $40,000,000; over 16,000 employees; products, $37,696,000. The increase from 1904 on the value of products was 47 per cent; increase of number of establishments, 26 per cent. Pawtucket has numerous fine churches and public and parish schools, a high school, English and classic school (private), a public library, founded in 1876, and several private business and industrial schools. Its proximity to Providence gives Pawtucket the advantage of the educational institutions of that city. It has one Home for the Aged Poor (Roman Catholic), the Emergency State Hospital and societies for the amelioration of the poor. Several fine bridges cross the river. It has a State armory, Dagget Park and several other smaller parks or squares which beautify the city. A number of the business buildings and blocks have considerable architectural merit. The annual municipal expenditures for maintenance and operation are about $840,000. The chief items of expense are, for schools, $243,000; for waterworks, $78,000; for police department, including truancy, etc., $73,000; fire department, $86,000; municipal lighting, $39,200. The city owns and operates the waterworks, which were opened in 1878, and which cost originally $1,333,000, and have since been enlarged at a cost of $500,000. Pop. about 60,000. Consult Davis (ed.), ‘The New England States,’ Vol. IV, pp. 2,533–2,534; Greene (ed.), ‘The Providence Plantations’; Grieve, Robert, ‘Illustrated History of Pawtucket’ (Pawtucket 1897).

PAX, in Latin, peace, (1) in Roman mythology, the goddess of peace; (2) in ecclesiastics, a utensil in the Roman Catholic Church, formed usually of a plate of metal, chased, engraved or inlaid with figures representing the Virgin and Child, the crucifixion, etc., which, having been kissed by the priest during the *Agnus Dei* of the high mass, is handed to the acolyte, who presents it to be kissed by each of the ecclesiastics officiating, saying to them *Pax tecum* (peace to thee). The decorations of the pax are frequently very rich. The «kiss of peace» was a custom or ceremony in use at very early times among Christians; and it would seem that it arose out of the practice of the men, women and children of the Christian sect saluting one another with kisses when they met together for public worship. This is more than probable since kissing in this way was an Oriental custom to which the Jews had taken previous to the Christian era.

PAXO, păk'sō (ancient **Paxos,** păk'sŏs), the smallest of the seven Ionian Islands (q.v.), lying eight miles southeast of Corfu. It is rocky, rises to a height of 800 feet, and has no fresh water supply, but is fertile, producing excellent olive oil, citrons, oranges and almonds. Facing it is the island of Antipaxos, which with it forms an eparchy in the administrative nome of Kerkyra, an island to which both Paxos and Antipaxos belonged in ancient times. Area, seven square miles; pop. about 5,000. Consult Ludwig Salvator, ‘Paxos und Antipaxos im Ionischen Meere.’

PAXSON, Frederick Logan, American historian: b. Philadelphia, 23 Feb. 1877. In 1898 he was graduated at the University of Pennsylvania and subsequently studied at Harvard. In 1903–06 he was connected with the department of history of the University of Colorado. In 1906 he was appointed assistant professor of American history, in 1907 junior professor at the University of Michigan, since when he has been professor of American history at the University of Wisconsin. He also taught American history at the summer sessions of the University of Chicago (1909), California (1913), Michigan (1915) and Pennsylvania (1917). In 1910 Mr. Paxson was research associate of the Carnegie Institution. He has published ‘The Independence of the South American Republics’ (1903); ‘The Last American Frontier’ (1910); ‘The Civil War’ (1911); ‘The New Nation’ (1915); ‘Guide to Materials for United States History since 1783, in London Archives’ (1914), with C. O. Paullin; also reviews and papers on American diplomacy, transportation and the history of the far West. He edited the ‘War Dictionary’ (1917, published by the Committee of Public Information).

PAXTON, păks'tŏn, Sir **Joseph,** English landscape-gardener and architect: b. Milton-Bryant, near Woburn, Bedfordshire, 3 Aug. 1801; d. Sydenham, 8 June 1865. He became superintendent of the gardens of the Duke of Devonshire at Chatsworth, in Derbyshire, where he designed the great conservatories. He also designed the Crystal Palace for the London International Exhibition in 1851, and soon after was knighted. In 1853–54 he superintended the erection of the new Crystal Palace at Sydenham. He was a Liberal member of Parliament for Coventry from 1854 until his death. He edited the ‘Horticultural Register’; the ‘Magazine of Botany’; the ‘Cottage Calendar’; and was the author with Lindley of a ‘Botanical Dictionary’ (1840); and ‘Paxton's Flower Garden’ (1850–53), and independently of ‘A Practical Treatise on the Cultivation of the Dahlia’ (1838).

PAXTON, William McGregor, American artist: b. Baltimore, Md., 22 June 1869. He studied under Bunker in Boston and at the École des Beaux-Arts of Paris. He painted a portrait of President Cleveland and portraits of many other prominent persons. He has exhibited at leading exhibitions in the United States and is represented in the permanent collections of the Metropolitan Museum of Art and the Pennsylvania Academy of Fine Arts, the Boston Museum of Fine Arts, the Corcoran Gallery, Washington, D. C., and the Cincinnati Museum of Art. In Philadelphia is his ‘Girl Sweeping’ and in New York ‘Tea Leaves’ and ‘Sylvia.’

PAXTON, Ill., city, county-seat of Ford County on the Illinois Central and the Lake Erie and Western railroads, 81 miles east of Peoria. It is in an agricultural region, a shipping point for farm produce and livestock and contains flour mills, brick and tile works, carriage, canning, furniture, broom and tile factories. It is the seat of the Rice Collegiate Institute, a coeducational secondary school under the auspices of the Congregational church. It has waterworks and an electric-light plant, the former being owned by the city. Pop. about 3,000.

PAYAGUA (pä-yä-gwä') **INDIANS**, a South American tribe residing in Paraguay. They were formerly very numerous in the Chaco region near Asuncion. They live in the swampy and wooded regions and consequently did not so much feel the pressure of civilization. Of late years they have decreased through absorption into the mestzos. The Payagua, also spelled Payaya, was a very prominent Cohuiltecan tribe who occupied the region of Texas along the San Antonio River. Their headquarters were near the site of the present city of San Antonio when they were first known by the whites. At the time when the Spanish missionaries were colonizing and Christianizing Southern Texas the Payagua occupied territory from the Rio Grande to the Brazos. They became very much attached to the missionaries and took to mission life. Later on they seem to have been, at last, partially fused with the Xarame whom the priests had moved, with the mission, from the Rio Grande northward into the neighborhood of San Antonio. Both tribes have become extinct, at least in so far as maintaining any tribal organization is concerned.

PAYER, pī'ĕr, **Julius von**, Austrian painter and Arctic explorer: b. Schönau (near Teplitz) 1 Sept. 1842; d. 1915. Educated at the military college of Wiener-Neustadt, he entered the Austrian army in 1859, and distinguished himself at Custozza. While stationed in northern Italy he explored several groups of mountains in the Alpine region; in 1869–70 took a prominent part in the second German north-pole expedition; and with Weyprecht directed an Austrian polar expedition which penetrated the sea between Nova Zembla and Spitzbergen and reached 79° north latitude (1871). In 1872 Payer and Weyprecht in a second expedition were hemmed in north of Nova Zembla in lat. 76° 30′ N. They discovered the archipelago which they called Franz Josef Land (q.v.) in honor of the emperor, and Payer made a sledge journey through it almost to lat. 83° N. (24 March–26 April). After his return in 1874, Payer withdrew from the military service, studied art, and in 1884 exhibited his first important picture, 'The Bay of Death.' Others of his works are 'The Death of Franklin'; 'Abandoning the Ship'; 'Religious Service'; and his best, 'Never to Return.' He won medals in Munich (1883), Berlin (1886), and Paris (1889). Among his writings is, 'Die Österreich-Ungarische Nordpolexpedition in den Jahren 1872–74' (1876).

PAYMASTER-GENERAL, in the United States navy, the chief officer of the Board of Supplies and Accounts. In the United States Marine Corps the paymaster-general is the chief officer of the pay department. In the British government the paymaster-general is a civil officer having the grade of minister ex officio; receiving the moneys appropriated by Parliament for the various State departments, and disbursing them in accordance with the orders of Parliament. The actual work of his office is conducted by a permanent staff headed by the assistant paymaster-general.

PAYMENT, *in law*, the discharge of a legal obligation by the delivery of money, or whatever is accepted by a creditor in lieu of money; but the creditor is not required, by law, to accept anything in payment except legal tender money. Payment should be made at the exact time and place agreed upon, or implied by law. Where no place of payment is designated the debtor must seek the creditor. If he fails to do this he may be considered in default. The effect of a valid payment is to discharge the debtor from his obligation. Payment must be made to the proper party, either to the person to whom the debt is due, or to his legal representative. In case of default of payment the creditor is entitled to proceed by process of law to enforce same. (See CONTRACT). Where payment is made to one of several joint creditors, the debt is considered legally discharged even though the person receiving the money fails to account for it to his associates. See DEBTOR; CREDITOR; LEGAL TENDER.

PAYN, pān, **James**, English novelist: b. Cheltenham, 28 Feb. 1830; d. London, 25 March 1898. He was educated at Eton and Cambridge and was editor of *Chambers' Journal*, 1859–71. In 1882 he succeeded Leslie Stephen (q.v.) as editor of the *Cornhill Magazine*, retaining this position till 1896, when failing health obliged him to relinquish it. For many years he wrote exclusively for *Chambers' Journal*, and from 1888 the page of 'Weekly Notes' in the *Illustrated London News* was from his pen. The long series of his books begins with 'Stories from Boccaccio' in 1852, and closes with 'The Backwater of Life,' which appeared in 1899, the 69th work of which he was the author. 'Lost Sir Massingberd' (1864) is the best known of his works, and its appearance in *Chambers' Journal* raised the circulation of the periodical 20,000 copies, and permanently established his popularity. Though in no sense an imitator of Dickens, Payn was not a little influenced by the manner of the elder novelist. He possessed a lively, fluent style, an abundant fund of humor, and many popular writers of the present owe to him in his editorial capacity the first recognition of their talents. He was as much read in this country as in his own, and among the best of his books may be cited in addition to those already named: 'Carlyon's Year' (1868); 'Gwendoline's Harvest' (1870); 'Cecyl's Tryst' (1872); 'At Her Mercy' (1874); 'Fallen Fortunes' (1876); 'By Proxy' (1876); 'A Grape from a Thorn' (1881); 'The Heir of the Ages' (1886); 'The Eavesdroppers' (1888); 'Gleams of Memory' (1894); 'The Burnt Million' (1894); 'In Market Overt' (1895); 'Another Burden' (1897); 'The Backwater of Life' (1899, a collection of essays published after his death).

PAYNE, Charles Henry, American Methodist Episcopal clergyman and educator: b. Taunton, Mass., 1830; d. 1899. In 1856 he was graduated at Wesleyan University and subsequently studied at the Concord (N. H.) Biblical Institute. In 1857 he entered the ministry of the Methodist Episcopal Church. He held pastorates until 1876 and from 1876 to 1888 he was president of Ohio Wesleyan University. Thereafter until his death he was secretary of the Board of Education of the Methodist Episcopal Church. In 1876 Dr. Payne served on the committee of revision of the 'Methodist Hymnal.' He published 'Guides and Guards in Character Building.'

PAYNE, David L., American soldier, pioneer and adventurer: b. near Fairmont, Grant County, Ind., 30 Dec. 1836; d. Wellington, Kan., 27 Nov. 1884. His mother was a first cousin of Davy Crockett (q.v.). His education was meagre as that of the average country lad of his times but he was always an eager reader. At the age of 21, he became a pioneer in Doniphan County, Kan. He entered the volunteer military service as a private at the outbreak of the Civil War and served three years. In 1864 he was elected to the State legislature and also served as a captain of militia during the Price Raid. He again entered the army as a private in the 18th Regiment of the United States Veteran Reserve Corps, with which he was at Appomattox. In 1867 he was commissioned captain of a troop of cavalry in the 18th Kansas battalion, which was recruited and organized for service against the Indians of the plains. In 1868, he received a similar commission in the 19th Kansas Regiment, raised for a similar purpose. In 1870, he settled on a homestead in Sedgwick County, Kan., whence he was sent to the State legislature in 1871. He then spent several years in the Rocky Mountains. Afterward he secured employment as an assistant doorkeeper of the House of Representatives, at Washington until the summer of 1879, when he returned to Kansas and became interested in the movement to settle on vacant public lands in the Indian Territory. He soon became the recognized leader of the «Oklahoma movement,» as it was known and, during the ensuing five years, was almost constantly employed in organizing and agitating the proposed settlement in the forbidden lands. He led no less than eight invasions into the Oklahoma country, being arrested and removed as an intruder in each case by the Federal authorities. Essentially a soldier of fortune, outwardly frank and generous, of robust and picturesque physique and possessed of a personality that was not lacking in magnetism, he easily became a hero in the eyes of the «colonists» or «Boomers,» as his followers were called, and they believed him capable of martyrdom in a holy cause. With the cool calculation of a demagogue and the swagger of a knight errant he combined the talent of an actor which enabled him to artfully play his part to the end. Yet, notwithstanding his obliquities and shortcomings, his success as an agitator made possible the opening of Oklahoma to white settlement much sooner than it would have been done otherwise and his picturesque career in that capacity was so unique as to insure him an indisputable place in the history of that State. While organizing another «colony» to invade Oklahoma, Payne died very suddenly. Payne County, Okla., was named in his honor.

PAYNE, Henry B., American statesman: b. Hamilton, N. Y., 30 Nov. 1810; d. Cleveland, Ohio, 9 Sept. 1896. He was graduated from Hamilton College in 1832, studied law and in 1834 removed to Cleveland, where he was admitted to the bar and established a law practice. In 1846 he entered politics, was State senator in 1849, and in 1860 attended the Charleston Convention, where he vainly endeavored to check secession sentiment. Throughout the war he was a strong Union man, and in 1872 was a member of the convention which nominated Horace Greeley for President. He was elected to Congress in 1874, in 1880 and 1884 was a candidate for the Democratic presidential nomination, and in 1885–91 was United States senator. He was for many years actively connected with industrial, railway, mining and other enterprises.

PAYNE, Henry Clay, American financier and politician: b. Ashfield, Mass., 23 Nov. 1843; d. Washington, D. C., 4 Oct. 1904. He was educated at Shelburne Falls Academy, Mass.; in 1863 went to Milwaukee, Wis., where he entered business as cashier in a drygoods store, and rose from this position to be one of the leading business men and financiers of the State. From 1886 he was president of the Wisconsin Telephone Company, and from 1889 president of the Milwaukee Electric Light and Railway Company; he was president of the American Street Railway Association in 1893–94, and was appointed receiver for the Northern Pacific Railroad in 1893. He was also active in politics and served as the secretary and chairman of the Republican county committee and of the State central committee. He was a member of the Republican national committee from 1880 till his death, and vice-chairman of the executive committee. For years he attempted to have the representation of each State in the Republican national conventions based on the actual Republican vote and not the representation of the State in Congress. From 1876–86 he was postmaster of Milwaukee, and in 1902 was appointed United States Postmaster-General in President Roosevelt's cabinet, a position he retained till his death.

PAYNE, John, English poet and Oriental scholar: b. London, 23 Aug. 1842, and later retired to private life to devote his life to literature. He studied for the bar and became a solicitor. He was one of a group of English verse-writers, including also O'Shaughnessy (q.v.) and Marzilos (q.v.), that followed the leadership of the pre-Raphaelite poets. Among his original volumes are 'A Masque of Shadows' (1871); 'Intaglios' (1871); 'Songs of Life and Death' (1872); 'Lautrec' (1878); and 'New Poems' (1880). He also made English renderings of Villon (1878), the 'Arabian Nights' (1882–84) 'Quatrains of Omar Khayyam' (1898); and 'Poems of Shemseddin Mohammed Hafiz of Shiraz' (1901); 'Flowers of France' (poems from Ronsard and Saint-Amant (1907). See 'Poetical Works of J. Payne' (2 vols., London 1902); 'Selections from the Poetry of John Payne' (New York 1906).

PAYNE, John Howard, American actor and dramatist, author of 'Home, Sweet Home': b. New York, 9 June 1791; d. Tunis, Africa, 10 April 1852. The date of his birth is commonly given as 1792, evidently because of an effort on some one's part to exaggerate his remarkable precocity, which was shown at 15, when, having left his boyhood home in Easthampton, Long Island, and having spent several years in Boston, where he was consumed with stage-fever, he became a clerk in a New York counting-house and spent his spare hours editing *The Thespian Mirror*. After two years in Union College in 1809 he made his first appearance on the stage as Young Norval in the Park Theatre, New York. A tour to London, 1812–13, followed, and there he wrote several dramas and adopted others, usually from the French. These are almost forgotten now. In ‹Clari, or the Maid of Milan,› an opera, appeared the song ‹Home, Sweet Home.› It was produced at the Covent Garden Theatre in 1823, and the music of the song was adapted by Henry R. Bishop from an old Italian melody. Payne knew intimately many English literary persons and corresponded with Coleridge and Lamb. In 1818 he brought out his very successful tragedy, ‹Brutus,› in which he would have taken the title rôle but for the objections of his manager, Kean, who became famous in the part. He renewed his labors as a critic of the stage, begun in *The Thespian Mirror,* in London during 1826–27, as editor of *The Opera Glass*. He returned to New York in 1832, and in spite of the handsome sums received for ‹Brutus,› ‹Virginius› and ‹Charles the Second,› was continually in financial embarrassment. In 1841–45, and from 1851 to his death, he was United States consul at Tunis. His body was removed thence to Washington, D. C., in 1883. His homeless, wandering life adds pathos to his great and well-known song. Consult Brainard, C. H., ‹John Howard Payne›; Harrison, Gabriel, ‹John Howard Payne› (1875), with an appendix containing Payne's juvenile poems and some of his dramatic criticisms; Hanson, W. T., ‹Early Life of John Howard Payne› (Boston 1913).

PAYNE, Joseph, English educator: b. Bury Saint Edmunds 1808; d. 1876. He gained an education practically through his own efforts, and in 1830 founded a grammar school for boys, which later became widely known as the Denmark Hill Grammar School. The Mansion House School at Leatherhead was founded by Mr. Payne in 1845. In 1872 Payne was appointed professor of the theory and practice of education at the College of Preceptors. He condemned the Eton system as undemocratic and otherwise defective. He was the author of ‹Lectures on the Science and Art of Education› (1883) and ‹Lectures on the History of Education, with a Visit to German Schools› (1892).

PAYNE, Oliver Hazard, American capitalist: b. Cleveland, Ohio, 1842; d. 27 June 1917. In 1863 he was graduated at Yale University and served with the Ohio infantry in the Civil War, retiring with the rank of brigadier-general of volunteers in 1865. In the following year he entered the iron manufacturing field at Cleveland and subsequently added oil refining to his interests. After 1884 he carried on his business in New York. He was a director of the Standard Oil Company and of the American Tobacco Company. Mr. Payne also served as vice-president of the Tennessee Coal, Iron and Railroad Company. He gave $500,000 to help establish the Cornell Medical School, and in 1913 endowed it with the sum of $4,500,000. The University of Virginia and Western Reserve were other institutions which benefited by Mr. Payne's gifts.

PAYNE, Sereno Elisha, American lawyer and legislator: b. Hamilton, N. Y., 1843; d. 1914. In 1864 he was graduated at the University of Rochester, studied law and in 1866 was admitted to the bar. He became member of a law firm at Auburn and soon took an interest in Republican politics. He was successively city clerk, supervisor and district attorney of Cayuga County in the 70's, and from 1883 to his death was a member of Congress, with the exception of the 50th Congress. In 1899–1910 he was chairman of the Ways and Means Committee. He also attended all the Republican national conventions from 1892 until his death. He was a member of the Joint High Commission which met to arrange a reciprocity treaty with Canada. Payne was prominent in all tariff legislation during his time in Congress. He was a conservative of the old type and toward the close of his life found himself at odds with the progressive rank and file of his party. He received the honor of a state funeral in the House of Representatives.

PAYNE, Will, journalist and novelist: b. Whiteside County, Ill., 9 Jan. 1865. He went to Chicago from Nebraska in 1890 and began his career on the *Daily News;* in 1896 was financial editor of the *Chronicle;* 1897–1904 financial editor of *The Economist*. He published ‹Jerry the Dreamer› (1896); ‹The Money Captain› (1898); ‹The Story of Eva› (1901); ‹On Fortune's Road› (1902); ‹Mr. Salt› (1903); ‹When Love Speaks› (1906); ‹The Automatic Capitalist› (1909); ‹The Losing Game› (1909); and contributed numerous short stories to leading magazines.

PAYNE, William Harold, American educator: b. Farmington, N. Y., 12 May 1836; d. 1907. He was educated in the New York Conference Seminary. In 1858–79 he was State superintendent of the public schools of Michigan and in 1879–88 was professor of science and the art of teaching at the University of Michigan. He was president of Peabody Normal College in 1888–1901, when he was recalled to the University of Michigan. He made translations of various pedagogical works, published monographs and addresses on educational matters, and wrote ‹School Supervision;› ‹Education of Teachers›; ‹Educational Doctrine›; ‹Contributions to the Science of Education.› He translated three of Compayré's best known works into English: ‹History of Pedagogy›; ‹Lectures on Teaching›; ‹Elements of Psychology.›

PAYNE, William Morton, American literary critic: b. Newburyport, Mass., 14 Feb. 1858. He was educated in the public schools, continuing his studies by himself; in 1874–76 was assistant librarian in the Chicago Public Library; since 1876 a teacher in the high schools of Chicago; in 1884–88 literary editor of the Chicago *Morning News,* and of the *Evening Journal* 1888–92. From 1892–1915 he was associate editor of *The Dial*. He was lecturer on literature in the University of Wisconsin in 1900 and in

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the universities of Chicago and Kansas in 1904, and has become known as a critic of the modern prose and poetry of different countries. He has published 'The New Education' (1884); 'Little Leaders' (1895); 'Various Views' (1902); 'Editorial Echoes' (1902); 'The Greater English Poets of the Nineteenth Century' (1907); 'Björnstjerne Björnson' (1910); 'Leading American Essayists' (1910). He has also made translations from the Norwegian and has contributed to numerous magazines.

PAYNE-SMITH, Robert, English theologian and oriental scholar: b. Chipping Campden, Gloucestershire, November 1818; d. Canterbury, 1 April 1895. He was educated at Oxford where he gained the Sanskrit scholarship in 1840 and a Hebrew scholarship in 1843. After taking orders in the English Church he spent a few years in parochial work, and in 1857 was appointed sub-librarian at the Bodleian library. He was regius professor of divinity at Oxford 1865–70, in the year last named becoming dean of Canterbury. He was a member of the Old Testament Revision committee and belonged to the evangelical party in the Establishment. His greatest work was the 'Thesaurus Syriacus' (1868 et seq.), and among his other publications are 'The Authenticity and Messianic Interpretation of the Prophecies of Isaiah Vindicated'; 'Prophecy: a Preparation for Christ'; 'Saint Cyril's Commentary on Saint Luke's Gospel'; 'The Third Part of the Ecclesiastical History of John, Bishop of Ephesus, now first Translated from the Original Syriac.' He also wrote commentaries on Daniel, Genesis, Jeremiah and Samuel.

PAYSANDU, pī-săn-doo′, a port and department of Uruguay, and its capital. The city, situated on a hill above the juncture of the San Francisco and the Uruguay, lies 170 miles north of Buenos Aires, with which, as well as with Montevideo, it has steamboat connections. A railroad runs to Montevideo and Salto. Founded in 1782 the city is well built and healthy, ranks all the Uruguayan cities except Montevideo in population, has a good educational system, is the seat of several consuls and an American commercial agent, and is one of the great slaughtering and packing centres of the region. From there come the famous Paysandu ox-tongues. Pop. about 30,000.

PAYSON, Edward, American Congregational minister: b. Rindge, N. H., 1783; d. 1827. In 1803 he was graduated at Harvard subsequently studied theology with his father, who was pastor at Rindge. In 1807 he was appointed pastor at Portland, Me., where he remained until his death, 20 years later. He published several volumes of sermons, which were very popular and caused their author to have more than a local reputation. Asa Cummings published his complete works with a memoir (3 vols., Philadelphia 1846; 2d ed., 1859).

PAYSON, William Farquhar, American author: b. New York, 18 Feb. 1876. He studied at Columbia University, and from 1893–95 was on the staff of the *New York Times*. For two years he was managing editor of *Vogue*, and then took up work as literary adviser and vice-president of the Sturgis and Walton Company, publishers (1909–13). Among his publications are 'The Copymaker' (1897); 'The Titlemongers' (1898); 'John Vytal' (1901); 'The Triumph of Life' (1903); 'Debonnaire' (1904), which in its dramatic form played throughout the United States in 1905–06; 'Barry Gordon' (1908); 'Periwinkle' (1910); 'Love Letters of a Divorced Couple' (1915).

PAYTA, pī′tä, **PAITA,** Peru, town and port of the northern part of the country, situated in a sort of amphitheatre about the bay. The city is little more than a port for Piura (q.v.), about 35 miles distant, within which a railroad nearly 60 miles long connects Payta. The harbor is excellent and the exports of cotton, tobacco, hides, hats and salt reach an annual value of about $6,000,000. There is an American consul in the town. Payta was sacked by the pirate Anson in 1741 and was nearly wrecked in 1877 by a heavy fall of rain, reputed the first for 30 years. Pop. (estimated) over 5,000.

PAZ SOLDÁN, päs sōl-dän′, **Mariano Felipe,** Peruvian geographer and historian: b. Arequipa, Peru, August 1821; d. Lima, Peru, 31 Dec. 1886. He was graduated in law at Arequipa in 1847 and established himself at Lima where he was connected with various government offices, and was at one time secretary to the Peruvian legation at Colombia. He visited the United States in 1853 in order that he might inspect the prison systems, and afterward as director of public works succeeded in making reforms in Peruvian prisons. Under President Castilla he was Minister of Foreign Affairs, and Minister of Justice under Balta. He wrote 'Atlas geográfico del Perú' (1861); 'Historia del Perú' (1866); 'Diccionario geográfico estadistico del Perú (1877); 'Historia de la Guerra del Pacífico' (1884).

PAZARDJIK, generally known as Tartar Pazardjik, a town of Bulgaria, in Rumelia, 25 miles northwest of Varna, with famous fairs in April. Pop. about 17,000.

PÁZMÁNY, Peter, Hungarian clergyman and author: b. Grosswardein, 1570; d. 1637. At the age of 13 he became a convert to the Roman Catholic Church and in 1587 became a member of the Jesuit Order. Pázmány was the ablest leader of those opposed to the so-called Reformation in Hungary. He was successively provost of Furócz, bishop of Nyitra, archbishop of Esztergom, and after 1629 cardinal primate of Hungary. He founded the Pazmaneum in 1623 and in other ways did much for the cause of education in Hungary. Consult his works edited by Bognár (Budapest 1894 et seq.) and Schwicker, 'Peter Pázmány' (Cologne 1888).

PAZZI, păt′sē, a wealthy and influential Florentine family which, led by one of its members, Jacopo Pazzi, was implicated in a conspiracy against Lorenzo and Guiliano de Medici in 1478. The plot failed and Jacopo Pazzi and his accomplices were executed.

PEA, an annual vine (*Pisum sativum*) of the family *Fabaceæ*, commonly grown in gardens all over the world. Its botanical variety *arvense* is the field pea. Except in the color of the flowers — white in the garden sorts and various tints of blue in the field varieties — and in the seeds, the two are nearly alike in appearence, since both are climbing vines with pinnate leaves, the odd terminal leaflet being replaced by a branching tendril. From its home in western

Asia and adjacent Europe, the pea has been taken by man to all civilized countries, but succeeds best in cool climates. It has been cultivated since very early times, its seeds being found in Egyptian tombs, and has developed a very large number of varieties, most of which, because of the plant's great tendency to vary, have disappeared, yet about 200 varieties of garden peas are offered annually by American seedsmen. These may be divided into early, medium and late; dwarf, half-dwarfed and tall; smooth-seeded and wrinkle-seeded; those with edible pods and those whose pods are not eaten by man. The wrinkle-seeded varieties are generally considered superior in flavor to the smooth-seeded, though the «marrowfat» varieties are highly prized by many people. The edible-podded sorts, which are prepared for the table like string-beans, are less popular in the United States than they deserve to be. In general the low-growing, quick-maturing varieties are most popular among market-gardeners. The so-called French peas (*petits pois*) are known to gardeners as the French canner or Turkey pea. The garden varieties are grown mainly for their immature seeds which are used as a vegetable; the field sorts are more widely employed as «split» peas for soup-making, etc. They are also largely used ground for stock food, but for this purpose the meal is generally mixed with other meal to lessen its soddenness. The dried garden peas are also used for soups. The vines of both kinds make excellent fodder and hay, for which purposes peas are often grown with barley or oats. The dried mature vines are used for bedding farm animals.

Peas thrive best upon fairly rich, well drained, loamy soils ranging in quality from heavy clay to light sandy loam, but not very well upon gravelly or sandy soils. They must not be over-supplied with nitrogenous plant-food, because this tends to rankness of vine at the expense of productivity. The fertilizers are preferably applied during the previous year, and the ground is plowed in late autumn and left rough until the spring, when, as soon as the ground can be worked, harrowing and seeding should be done. Spring plowing is also frequently practised. The seed should be sown an inch or two deep, in drills varying in distance apart with the height of the vines, the usual distance being equal to the height. The tall growing varieties are generally supported with «brush» or wire trellises. Except in keeping the surface clean and loose no cultivation should be given since unnecessary disturbance of the soil injures the roots. Field-peas are generally broadcast, but when drilling machines which do not split the seed can be used they are preferable. The plants are hardy, being able to withstand light frosts without injury. They do not, however, succeed well in hot, dry weather, being subject to wilting and mildew, the tall kinds especially. The northern United States and Canada are the chief sources of dried peas in the markets, and these regions furnish practically all of the seed sold by American seedsmen.

Peas, either green or mature, are highly prized as food for man and animals. They are rich in protein and are readily digestible when cooked until they become soft. Immense quantities of green peas are canned, the chief localities of this industry being Maryland, Delaware, and New Jersey, where special mahchinery is used not only in their cultivation but in their preparation for canning. Perhaps the most remarkable machine is the «viner,» into which the vines are fed as they come from the field, and in which revolving beaters and cylinders remove the green seeds as satisfactorily as a pea-thresher separates the dry one from their pods and vines. The average percentage composition of dried peas is: Carbohydrates, 62.0; protein, 24.6; water, 9.5; ash, 2.9; fat, 1.0. Green peas average as follows: Water, 76.6; carbohydrates, 16.9; protein, 7.0; ash, 1.0; fat, 0.5. Edible-podded varieties average as follows: Water. 81.8; carbohydrates, 13.7; protein, 3.4; ash, 0.7; fat, 0.4.

Several more or less closely related plants of the family *Fabaceæ* are called peas, each, however, with a modifying adjective. The best known of these are the following: Everlasting pea (*Lathyrus latifolius*), a perennial, floriferous herb often planted in gardens for ornament, especially for concealing unsightly objects such as rubbish-heaps, stones, etc.; sweet pea (*Lathyrus odoratus*), a well-known garden annual flowering herb described under its popular name; glory pea, glory vine, or parrot's bill (*Cliannthus dampieri*), a tender sub-repent shrub with unique, showy flowers, for which it is cultivated somewhat in greenhouses but has not become widely popular because of its proneness to the attacks of red spider and its difficult management; hoary, pigeon, Toor, Kongo or Dhal pea (*Cajanus indicus*), an Asiatic species widely cultivated in tropical countries for its seeds which are used for food; scurfy pea (*Psoralea spp.*), many herbs, shrubs, and sub-shrubs natives of various countries, where several are used as border plants in gardens; chick pea (*Cicer arietinum*), an annual herb of western Asia and the Mediterranean region where it is largely cultivated for its ripe seeds which are used as food; and sea or beach pea (*Lathyrus maritimus*), a native of seacoasts throughout the Northern hemisphere and valued in rocky and sandy gardens because of its ability to grow under very adverse conditions.

Insect Pests.— Of the score or more insects which feed upon the pea, the most troublesome is probably the green pea louse (*Nectarophora destructor*) of the order Hemiptera. Like other plant lice (q.v.) this insect multiplies very rapidly and in seasons favorable to it does prodigious damage, especially in regions which supply canning factories with peas. Before the middle of June in 1900 the damage was estimated at $4,000,000, and that of the previous season at $3,000,000. In one season it spread havoc from New Brunswick to Virginia destroying approximately 50 per cent of the crop. Very early and very late planting have been suggested as preventive measures, as has also the avoidance of two successive leguminous crops upon the same land. As remedies, spraying with kerosene emulsion (see FUNGICIDES) has been tried with indifferent success, but brushing the insects with special machines is more satisfactory. The rows of plants are made far enough apart to permit of horse cultivation, which is given immediately after the brushing, so as to bury the insects before they can return to the vines.

The next most troublesome insect is the pea-weevil (*Bruchus pisorum*) which lays its eggs upon the young pods into which the larvæ burrow, finally transforming to pupæ in the mature seed from which the adults issue during late summer and autumn, although in the North they generally wait until the spring. The adults hibernate, lay their eggs, and die; they do not reproduce in or feed upon stored peas. Fumigation with carbon bisulphide or hydrocyanic acid gas are often resorted to, the seed being enclosed in air-tight receptacles. Holding the seed over for a year in bins from which the beetles cannot escape is also recommended, as is also late planting, this last being thought to obviate egg laying, the insect not living until the peas come into flower.

Of the other insects which do serious injury the following are probably the commonest: Ash-gray blister beetle (*Macrobasis unicolor*) and several of its close relatives. These eat the leaves of peas, beans and several other leguminous plants during early summer, though earlier in the year their larvæ may have helped to hold the grasshoppers in check by eating their eggs. Spraying with Paris green and driving the insects to winrows of straw to be burned are recommended. Several cutworms often do serious injury (see Cutworm), as does also the boll-weevil (q.v.). The European pea-moth (*Semasia nigricana*), a dreaded pest of foreign fields, is known to be an arrival in Canada and pea growers are dreading the possible spread of the insect. There are also several general feeding insects such as leaf-hoppers and plant-bugs which are occasionally troublesome to the agriculturist.

PEA-CRAB, an English name for *Pinnotheres pisum,* known in the United States as the oyster-crab (q.v.).

PEA RIDGE, Battle of, a battle of the Civil War, fought 7–8 March 1862. Gen. S. R. Curtis had driven the Confederate troops out of Arkansas into Indian Territory, and made his headquarters at Fayetteville in the extreme northwest, when he heard that Van Dorn, with Price, McCulloch, Albert Pike, and some 25,000 men, were rapidly marching against him. The actual effective strength of the Confederates was by the official records, 16,202 infantry and cavalry and about 50 cannon. According to Van Dorn's official report less than 14,000 were brought into the battle. Falling back to Sugar Creek, which half encircles a high plateau cut by ravines, called Pea Ridge, he strengthened his front. Van Dorn thereupon swung his army to the left and reached Pea Ridge in the rear of Curtis, to cut off his communications and reinforcements, thus making his elaborate frontal preparations worthless. Curtis at once faced his army to the rear, his left on the creek and his right on Elkhorn Tavern at the crest of the ridge, the Confederate left being at the latter. On the morning of the 7th the Confederates made a fierce assault, which for a time seemed to carry all before it; but it was in two unrelated divisions. McIntosh and McCulloch on the right ambushed and outflanked Osterhaus; Van Dorn and Price at Elkhorn Tavern decimated Colonel Carr's forces. The latter carried on a seven hours' fight till near the last without reinforcements — which could not be spared him — so heroically that one-fourth of his troops were killed or wounded. The Confederate right was making a final effort to break the Union line and join the left, when Curtis brought in his last reserves, and in a desperate combat in the woods both McCulloch and McIntosh were mortally wounded; whereupon their troops retreated, and Sigel reinforced Carr and stopped the progress of Price, who was badly wounded. The Federals lost some guns and some ground, being driven half a mile beyond Elkhorn Tavern, which was the headquarters of Van Dorn on the night of the 7th, as it had been of Carr in the morning. On the morning of the 8th the Federals renewed the fight, and Van Dorn, after a hard struggle, retreated. Van Dorn estimated the strength of the Union army at from 17,000 to 24,000. But the official records show their actual strength to have been 10,500 infantry and cavalry and 49 cannon. The Union troops lost 1,351, more than half of them from Carr's division; the Confederates probably lost as many, since Van Dorn says that his loss was between 800 and 1,000 killed and wounded and 300 missing.

PEA-TREE. See Pepper-tree.

PEA-WEEVIL. See Bean-weevil.

PEABODY, pē'bŏd'ĭ, **Andrew Preston,** American Unitarian clergyman: b. Beverly, Mass., 19 March 1811; d. Cambridge, Mass., 10 March 1893. He was graduated from Harvard in 1826, studied also at the divinity school, became in 1833 colleague of Nathan Parker at the South Parish Church of Portsmouth, N. H., and soon afterward sole pastor. In 1860 he was made Plummer professor of Christian morals and ethics at Harvard, and this post he held until his resignation in 1881, when he received an emeritus appointment, his attention being thenceforth given chiefly to literary work. In 1862 and 1868–69 he was acting president of Harvard. He was editor of the *North American Review* in 1852–61, and besides more than 100 addresses and special sermons, published several volumes including 'Lectures on Christian Doctrine' (1844); 'Conversation: Its Faults and its Graces' (1856); 'Christianity the Religion of Nature' (1864); 'Reminiscences of European Travel' (1868); 'Manual of Moral Philosophy' (1873); 'Christianity and Science' (1874); 'Christian Belief and Life' (1875); 'Moral Philosophy' (1887); 'Harvard Reminiscences' (1888); 'Harvard Graduates Whom I Have Known' (1890); 'Masterpieces of Cicero' (1912). Consult De Normandie, James, 'Memorial Sermon on Andrew Preston Peabody.'

PEABODY, Cecil Hobart, naval architect: b. Burlington, Vt., 9 Aug. 1885. He was graduated from the Massachuetts Institute of Technology in 1877 and in 1878 was appointed professor of mathematics in the Imperial Agricultural College, Sapporo, Japan. In 1881 he was assistant professor of mechanical engineering at the University of Illinois and in 1883 went to the Massachusetts Institute of Technology where he has been associate professor of steam engineering and, since 1893, professor of naval architecture and marine engineering. He is member of the council of the Society of Naval Architects and Marine Engineers and

Fellow of the American Academy of Arts and Sciences, and in 1915 received the Order of the Rising Sun (Japan) third class. He has published ‘Thermodynamics of the Steam Engine’ (1889); ‘Valve-gears’ (1892); ‘Naval Architecture’ (1904); ‘Thermodynamics of the Steam Turbine’ (1911); ‘Computations for Marine Engines’ (1913).

PEABODY, Elizabeth Palmer, American writer and educator: b. Billerica, Mass., 16 May 1804; d. Jamaica Plain, Mass., 4 Jan. 1894. She engaged in teaching at 16 and later studied Greek under Emerson. She taught under Amos Bronson Alcott (q.v.), was for a time secretary to William Ellery Channing and subsequently was largely instrumental in introducing the Froebel kindergarten system into the United States. Among her publications, which are chiefly of an educational character, are ‘First Steps in History’ (1833); ‘Crimes of the House of Austria’ (1852); ‘Kindergarten Culture’ (1870); ‘Kindergarten in Italy’ (1872); ‘Reminiscences of William Ellery Channing’ (1880); ‘Letters to Kindergartners’ (1886); ‘Education in the Home Kindergarten’ (1887), etc.

PEABODY, Francis Greenwood, American Unitarian clergyman and educator: b. Boston, Mass., 1847. He was graduated from Harvard in 1869, from the Harvard Divinity School in 1872, and in 1874–80 was pastor of the First Parish Church at Cambridge, Mass. From 1880–86 he was professor of theology in the Harvard Divinity School, and from 1886–1912 was Plummer professor of Christian morals at Harvard University, retiring as emeritus professor in 1912. He has published ‘Mornings in the College Chapel, First Series’ (1896); ‘Afternoons in the College Chapel’ (1898); ‘Jesus Christ and the Social Question’ (1900); ‘Religion of an Educated Man’ (1903); ‘Jesus Christ and the Christian Character’ (1905); ‘Mornings in the College Chapel, Second Series’ (1907); ‘Approach to the Social Question’ (1909); ‘Evenings in the College Chapel’ (1911); ‘Christian Life in the Modern World’ (1914).

PEABODY, George, American merchant and philanthropist: b. Danvers (now Peabody), Mass., 18 Feb. 1795; d. London, England, 4 Nov. 1869. His parents were poor, and after a common school education he became clerk in a grocery store at the age of 11. In 1812 he went to Georgetown, D. C., as clerk in his uncle's grocery; but a few years later entered into partnership with Elisha Riggs in the wholesale dry goods business, at Baltimore. Largely through his untiring industry the firm became prosperous and influential, and his partner retiring in 1829, he was left at the head of the business. In behalf of his firm he had several times visited London, and decided to make that his permanent residence. He consequently severed his connection with his American firm, established in London a banking and mercantile business under the firm name of George Peabody and Company and amassed a large fortune. This wealth he devoted largely to promoting education, giving most generously to several institutions. He gave $200,000 to found an institute with a free library and lecture course in his native town of Danvers; and to the city of Baltimore gave $1,400,000 for an institute combining free library and lectures with an academy of music and an art gallery. In 1866 this institute was opened and he was present at the dedication ceremonies. He further gave $150,000 to Yale for a museum of natural history; the same amount to Harvard for a museum of archæology and ethnology; $140,000 to Salem, Mass., to found the Peabody Academy of Science; and an endowment of $13,000 to the Newburyport public library. In 1862 he placed in the hands of trustees in the city of London $750,000 for the building of model tenement-houses for the poor to be let at moderate rents. This plan proved so successful and the houses were so well patronized that he later increased the fund to $2,500,000, it being known as the London Peabody fund. In 1851 he contributed $15,000 for the improvement of the United States exhibit at the London World's Fair; and in 1852 gave $10,000 to the second expedition under Dr. Kane in the search for Sir John Franklin. Hence a part of the region discovered by this expedition was named in his honor Peabody Land. His last and most important gift was that of $3,500,000 for the promotion of education in the Southern States, under the control of a special board of trustees, and known as the Peabody Educational Fund (q.v.). The total amount of his gifts was between $8,000,000 and $9,000,000. His benefactions were so eminently wise and helpful to the community that he was greatly respected and beloved in both England and America. In 1866 he was given the freedom of the city of London, an unusual honor; and the queen sent him an autograph letter and a miniature portrait of herself, both of which are at the institute in Peabody, Mass. A public funeral was given him in Westminster Abbey; and his remains were brought to the United States by the British ship-of-war *Monarch,* and buried with fitting honors at Danvers, Mass. (See Peabody College for Teachers; Peabody Educational Fund). Consult The ‘Life’ by Hanaford (1870); Bolton, ‘Poor Boys who became Famous’ (1888); Curry, ‘Brief Sketch of George Peabody’ (1898).

PEABODY, George Foster, American banker: b. Columbus, Ga., 27 July 1852. He was educated in private schools and is president of the Broadway Realty Company, the Mexican Coal and Coke Company, the Compania Metallurgica Mejicana, and director in many other corporations. In 1896–1905 Mr. Peabody was treasurer of the Democratic National Committee. He is chairman of the State of New York Reservation Commission, director of the General Education Board, the Southern Education Board, the Hampton Normal and Agricultural Institute, the Tuskogee Normal and Industrial Institute, the University of Georgia, the Skidmore School of Arts, the New York Chamber of Commerce. In 1903 he received the honorary degree of A.M. from Harvard, that of LL.D. in the same year from Washington and Lee and in 1906 from the University of Georgia.

PEABODY, Henry Oliver, American inventor: b. Boxford, Mass., 13 May 1826; d. Point Allenton, Mass,, 28 July 1903. At the outbreak of the Civil War he was employed in an arms factory in Boston, and there invented the breech-loading gun known as the Peabody

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rifle. It was manufactured in large quantities by a Providence establishment for the Turkish government. Its pattern was copied extensively in Europe, where it was not patented.

PEABODY, James Hamilton, American banker: b. Topsham, Vt., 21 Aug. 1852. He was educated in the public schools of his native town, and going to Colorado engaged in business first as a bookkeeper and then as a merchant in Cañon City. In 1885 when the First National Bank of Cañon City was organized he was chosen vice-president, and later became president. He has also been active in public life, has been city clerk, member of the school board, city treasurer and member of the city council; in 1885 he was elected county clerk on the Republican ticket. In 1902 he was nominated and elected governor of Colorado for a two years' term. He has been a prominent member of the Masonic fraternity.

PEABODY, Josephine Preston, American poet: b. New York, 1874. She was educated at Radcliffe College and was instructor in English literature at Wellesley College, 1901–03. In 1906 she married Prof. L. S. Marks of Harvard University. In 1909 her drama 'The Piper' won the Stratford-on-Avon prize. This drama was presented throughout New England the following year and in New York in 1911. She is a contributor, especially of poetry, to leading magazines. (See THE PIPER). She is the author of 'Old Greek Folk Stories' (1897); 'The Wayfarers: a Book of Verse' (1898); 'Fortune and Men's Eyes: New Poems with a Play' (1900); 'Marlowe,' a drama infused with the Elizabethan spirit, and containing several beautiful lyrics (1901); 'The Singing Leaves' (1903); 'The Wings' (1905, a drama); 'The Book of the Little Past' (1908); 'The Singing Man' (poems, 1911); 'The Wolf of Gubbio' (drama, 1913); 'New Poems' (1915).

PEABODY, Robert Swain, American architect: b. New Bedford, Mass., 22 Feb. 1845; d. 23 Sept. 1917. In 1866 he was graduated at Harvard University, and subsequently studied at the École des Beaux-Arts, Paris. He established his practice in Boston in 1870 and from 1909 until his death was chairman of the Boston park commission. His principal works are the Boston Chamber of Commerce, the city hall of Worcester, Mass., the Chamber of Commerce of Cleveland, Ohio, and Machinery Hall at the Columbian Exposition at Chicago in 1893. For many years Mr. Peabody was an overseer of Harvard and in 1900–01 was president of the American Institute of Architects and in 1902–05 and 1907–09 of the Boston Society of Architects. In 1910 he was made an associate of the National Academy of Design. He published 'A Holiday Study of Cities and Ports' (1908) and 'An Architect's Sketch Book' (1912).

PEABODY, Selim Hobart, American educator: b. Rockingham, Vt., 20 Aug. 1829; d. Saint Louis, Mo., 27 May 1903. He was graduated from the University of Vermont in 1852, appointed professor of mathematics and engineering at the Polytechnic College at Philadelphia, Pa., where he remained from 1854–57 and was later connected with various educational institutions in the West. He was professor of physics and engineering at the Massachusetts Agricultural College in 1871 and in 1878 accepted the chair of mechanical engineering at the Illinois Industrial Academy at Champaign, Ill. He was elected president of that institution in 1880 and under his administration it became the University of Illinois. He resigned the presidency in 1891 to become chief of the department of liberal arts at the World's Columbian Exposition. Among his publications are 'Astronomy' (1869); 'Juvenile Natural History' (3 vols., 1869); 'New Practical Arithmetic' (1872); 'American Patriotism' (1880); 'Charts of Arithmetic' (1900).

PEABODY, Mass., town, the world's largest sheepskin town, Essex County, on the Boston and Maine Railroad, two miles west of Salem. It includes the villages of Peabody, North Peabody, South Peabody and West Peabody. The town was incorporated in 1855 as South Danvers, and, in 1868, the name was changed in honor of George Peabody (q.v.), who was born there. The most important of its manufactures is leather, plain and morocco; others are shoes, electrical supplies, tanning machinery, hair goods and glue. It contains the Peabody Institute, founded in 1852 by George Peabody, and the Eben Dale Sutton Reference Library. The institute is under the management of a board of trustees who report annually to the town government; it contains a library of 47,600 volumes (1916) and a lecture hall in which free lectures are given. The Sutton Library is under the control of the same trustees. In 1902 the Peabody Historical Society presented the institute with a small safe containing pictures of the town, articles by leading citizens and newspapers, which is «to be opened by the citizens of Peabody on or after 16 June 2002.» Pop. 18,625.

PEABODY-BIRD, the white-throated sparrow (q.v.), so called in northern New England.

PEABODY COLLEGE FOR TEACHERS. In 1867 George Peabody made his memorable donation to the cause of Southern education, giving first and last over $2,000,000 to a distinguished body of gentlemen from various Northern States as well as from the South. These gentlemen organized themselves under the title «The Trustees of the Peabody Education Fund.» Peabody Normal College was established as the first central work of the Peabody Education Fund at Nashville, Tenn., in 1875. The institution grew steadily and received increased appropriations from the State of Tennessee as well as from the Peabody Education Fund, using the grounds, buildings and equipment of the University of Nashville by courtesy of that institution. From the outset Peabody College was designed for the higher training of teachers and to encourage State support for normal schools and for the development of public education. It has remained true to that mission, changing and advancing its curriculum as adapted to the larger aims in Southern education as related to the entire nation. As Peabody College grew in number of students and in influence, it became necessary to secure a permanent endowment and a more stable policy. From 1905 to 1909 these plans were worked on energetically and with success. For 30 years the college had run successfully without a charter of its own and with no income except annual appropriations. In 1909 the institution was duly incorporated on 30 September under the title "George Peabody College for Teachers." Its new board of trustees held their first meeting on 5 October of that year. George Peabody College for Teachers now received an endowment of about $1,750,000. In 1911 plans for new buildings on a new campus were begun, and from that date to 1914 a successful campaign for additional funds was prosecuted, resulting in bringing to the college $1,500,000 of new endowment. The college now owns a very attractive campus of 50 acres adjacent to the campus of Vanderbilt University on the one side and the campus of Ward-Belmont College on the other, forming a group of about 125 acres of almost continuous campus in the best residential section of Nashville. Good physical surroundings of the college are, therefore, secured for all time. On the campus there are now five buildings of new fire-proof construction, designed in classical style, with special reference to Southern colonial architecture. These five buildings have been erected at a cost of over $1,000,000. The total resources of the college are now nearly $3,750,000. The college has been organized on the quarter plan since 1908, following in the main the system which has been so successful at the University of Chicago. With Vanderbilt University there is a contractual arrangement by which students in either institution may choose as much as one-third of their studies in the other institution. This makes it possible for each institution to put all of its resources and energy into special departments without duplication. Thus there is created in resources and strength virtually a single institution backed by something like $8,000,000. Scholarships bestowed by the Peabody Fund are given to a certain number of worthy students of the college. The degree of licentiate of instruction is conferred by the college, and the student holding this degree is by law eligible, without any further examination, for any teaching position in the public schools of Tennessee. The university confers other degrees: master and bachelor of arts, letters and science. George Peabody College for Teachers has its alumni and former students in almost every kind of educational position throughout the South and the United States and foreign countries. Over 15,000 students have attended the institution and at least 3,000 graduates have received diplomas from its faculty. At present the summer quarter is very popular with progressive teachers in active service, who come for six weeks or 12 weeks and receive instruction which they take back to their important positions throughout the entire South. The summer quarter has usually about 1,500 students. There are about 500 students in the fall, winter and spring quarters.

Charles E. Little.

PEABODY EDUCATION FUND, founded in 1867 by George Peabody (q.v.) for educational purposes in the South. In the articles of endowment the words are that the money shall be used for promoting "intellectual, moral and industrial education in the most destitute portion of the Southern States." The first gift was securities amounting to $2,100,000 of which $1,000,000 were Mississippi State bonds. The Mississippi bonds were afterward repudiated. Mr. Peabody gave $1,000,000 additional in 1869. Of this amount $384,000 were Florida bonds, issued while that section was a Territory, and for certain reasons such bonds had never been recognized as legal by the State. The fund was placed in charge of 15 trustees, men prominent in the United States — Robert C. Winthrop of Massachusetts was chairman.

The trustees held meetings annually, generally in New York City. They filled vacancies caused by death or resignation and transacted such business as was necessary. The trustees had authority to spend the interest and 40 per cent of the principal the first two years; after that time the principal was to remain intact for 30 years, when the whole amount might be divided and distributed for educational purposes, as might be deemed best by the trustees. The rules governing the use of the fund were broad and precautions were taken not to interfere with established schools. Efforts were to be made to work with existing schools, to strengthen weak schools and to promote in general elementary education. No school should receive aid unless it had in attendance at least 100 students and maintained a school 10 months in the year. The district desiring a share of the fund should contribute twice the amount granted by the trustees. A school having an attendance of 100 pupils and complying with other conditions, might have $300; if 200 pupils were in attendance, it might have $600; and a school with 300 in attendance might have $1,000. Normal and training schools for teachers received special attention. Scholarships were granted to many worthy pupils — at first $200 each, later $100. From the establishment of the fund to the end of the 30 years the total amount paid out was about $2,600,000. The greater part of this sum was used in Alabama, Arkansas, Florida, Georgia, Louisiana, Mississippi, North Carolina, South Carolina, Texas, Tennessee, Virginia and West Virginia. The policy of the trustees of the fund and their agents became a most powerful influence in developing public education, universal and genuinely democratic, and made a marked impression on every type of school in the South, its chief instrument being the Peabody College for Teachers (q.v.). Consult Little, C. E., 'George Peabody College for Teachers: Its Evolution and Present Status' (Nashville 1912); Reports of United States Commissioner of Education, in which will be found an account of the foundation and distribution of the fund.

PEACE (*in law*). See Breach.

PEACE, Breach of. See Breach.

PEACE, Religious (German, *Religionsfriede*), a series of treaties by which, after the Reformation, the Protestant states were granted their religious liberty. There are two treaties which especially bear this name, that of Nuremberg, signed by the Protestants on 23 July and confirmed by the emperor, Charles V, at Ratisbon, 2 Aug. 1532, and that of Augsburg, 26 Sept. 1555. By the treaty of Nuremberg the emperor pledged himself to summon a council to settle all religious differences, and both sides agreed to suspend hostilities until the council should be convoked. The Protestants gained by this peace only a temporary security. The Peace of Nuremberg was renewed six times between 1534 and 1545. The victory of Charles over the Schmalkaldic League placed the whole of Germany at his mercy, when the declaration of war by the Elector Maurice compelled him to accept the Peace of Passau, 31 July 1552, by which the right of the evangelical states to the free exercise of their religion was acknowledged by the emperor, who promised to convene a diet to settle the rights of the two religious parties and the rights of the imperial authorities. Several circumstances delayed the meeting of the diet, which took place at Augsburg in 1555, presided over by the Archduke Ferdinand, and concluded the treaty known as the Religious Peace of Augsburg, which provided that no state was to be disturbed on account of its religion. Subjects were not forbidden to leave a state where their religion was persecuted, and the Protestants were to retain all the ecclesiastical benefices in their possession after the Peace of Passau. The Calvinists were not included in the provisions of this treaty, but by the Peace of Westphalia (1648), which placed the Calvinists on the same footing with the Lutherans, a permanent peace was established.

PEACE CONFERENCES. See HAGUE COURT; PEACE TREATIES; WAR, EUROPEAN — PEACE CONFERENCE.

PEACE CONVENTION, in American history, a term used at the beginning of the Civil War. After the secession of several of the Southern States, Virginia on 1 Jan. 1861 invited the other secession States to send delegates to a conference in Washington, D. C., with the object of devising a plan whereby all differences between the North and the South might be peaceably settled. The conference met 4 February and delegates were present from 14 free States and seven slave States. Ex-President John Tyler was made presiding officer. A committee of one from each State was appointed to draw up a report of «what they may deem right, necessary, and proper, to restore harmony and preserve the Union.» Several minority reports were presented, but the majority report was adopted. It recommended a number of amendments to the Constitution, the substance of which was as follows: (1) In the Territories north of lat. 36° 30′ slavery was to be prohibited. In Territories south of that line the institution was to remain as it then was, and no law was to be passed abridging the right of a man to take his slave thither. The status of new States was to be determined by the constitution adopted by them. (2) No new territory was to be acquired except by discovery or for naval and commercial stations or depots, without the concurrence of a majority of the senators from the free States and a majority of the senators from the slave States. (3) Neither the Constitution nor any amendment thereof was to be construed as giving Congress power to interfere with slavery in any State; nor to abolish it in the District of Columbia without the consent of the State of Maryland and of the owners, nor without compensation to the latter; nor to prohibit representatives and others from taking their slaves to the District and bringing them away again; nor to prohibit slavery in any place under the jurisdiction of the United States, if within a slave State; nor to prohibit the inland slave trade between slave States, but not in or through free States. The slave trade in the District was prohibited. Section 4 provided for the delivery of fugitive slaves, section 5 for the prohibition of the foreign slave trade, section 7 for the payment to owners by the United States of the value of slaves that might escape by reason of the interference of mobs with Federal officers, and for «securing to the citizens of each State the privileges and immunities of citizens in the several States,» while section 6 ordained that sections 1, 3 and 5 and article 1, section 2, clause 3, and article 4, section 2, clause 3 of the Constitution were to be amended or abolished only by the unanimous consent of the States. This report was offered to the Senate, which refused to act upon it, and it met a similar fate in the House, neither party being satisfied with it.

PEACE OF GOD, a cessation from private warfare which the Roman Catholic Church in France in the 10th and 11th centuries tried to impose upon the nobles of that country. The ecclesiastical authorities in several synods recommended that all differences should be settled by the ordinary civil tribunals, and attempted to enforce obedience or at least compliance by threats of spiritual penalties. But these efforts were all in vain, the nobles refusing to submit to any of the minor courts — the only ones then existing. A compromise was arrived at which resulted in the establishment of what was known as the Truce of God (q.v.).

PEACE OF THE PYRENEES. See PYRENEES, PEACE OF THE.

PEACE RIVER, Canada, an important affluent of the Mackenzie (q.v.).

PEACE SOCIETY, an organization founded for the purpose of promoting universal peace on a permanent basis among the nations. William Allen and Joseph Price organized a peace society in London in 1816; but the first peace society on the European continent was established in Geneva in 1830. At the International Peace Congress held in London in 1843 there were present 294 British, 37 American and six Continental delegates. The society, more or less a religious movement, asked the support of all denominations as well as of persons who oppose war on any grounds. It has always advocated a gradual disarmament by all the nations of Europe, but its main contention is the necessity for adopting the principle of arbitration in international disputes. See AMERICAN PEACE SOCIETY; CARNEGIE ENDOWMENT FOR INTERNATIONAL PEACE; PEACE CONVENTION.

PEACE TREATIES. Although comparatively few peace treaties were negotiated prior to the Middle Ages, the making of such agreements, as well as the observance of treaties in general between the great nations of the world, was one of the first phenomena to indicate the advance of civilization. In the history of international law there were few subjects that received earlier attention. The Greek and Roman historians devote much space to the subject, while the fact that nations had given thought to this method of settling grievances ages before these chronicles were written is indicated by the references to such agreements which appear in the Old Testament writings as well as by the records discovered upon the ancient monuments of Egypt and Assyria. Even the movement for universal arbitration, the principle which attained its culmination in The Hague tribunal, is almost as old as the records of history. It is true that the first instances of arbitration, especially those of Greece, were intermunicipal, rather than between the different races. During the Middle ages the popes were frequently appealed to, and it was in response to such demands that Innocent III became the mediator between King John and his barons; Boniface VIII arbitrated the difficulties between Edward I and Philippe le Bel; Leo X arranged affairs for Maximilian and the Doge of Venice, just as, in more modern times, Leo XIII adjusted the dispute of Germany and Spain in relation to the Caroline Islands. It was as early as 1603 that Sully suggested his plan for a «Concert» of the 15 states, by which all international differences were to be decided. A century later the Abbé Saint Pierre proposed the organization of his «General League of Christendom,» but, although his international peace court was based upon a less ulterior motive than that of Sully, it had little effect except to inspire a hundred or more similar schemes which helped to prepare the world for the organization of the 19th century tribunal of arbitration at The Hague.

The most important treaty to which the United States has been a party was the Peace of Paris, the preliminaries of which were signed in that city 13 Nov. 1782. In announcing the settlement of these preliminaries John Adams wrote: «We have been very industrious, having been at it forenoon, afternoon, and evening, ever since my arrival,» while Benjamin Franklin, who was also a member of the commission, added: «We hope the terms we have secured will be satisfactory, though to secure our main points we may have yielded too much in favor of the royalists.»

Despite the fact that the treaty was so favorable to his interests, George III did not see fit to ratify it until 6 Aug. 1783. On the 3rd of the next September the definite treaty of peace, which formally acknowledged the existence of the new republic as a nation, was signed, also at Paris, and 14 July 1784 it was duly confirmed by Congress.

The following list includes the most important peace treaties negotiated by the various nations of the world:

Aarau.— At the conclusion of the religious war in Switzerland, which ended in a victory for the Protestants, 25 July 1712, the Treaty of Aarau was signed, 15 Aug. 1712. By its provisions the two religions were equalized throughout the Swiss provinces.

Abo.— A treaty signed by Russia and Sweden, 18 Aug. 1743. By its provisions Russia acquired the southern territory of Finland as far as the river Kymen, and the privilege of electing an ally as prince royal of Sweden.

Adrianople.— This important treaty between Russia and Turkey was signed at Adrianople, 14 Sept. 1829. By its provisions Turkey not only recognized the independence of Greece, but gave to Russia nearly all the rights she demanded, including the control of a part of the left bank of the lower Danube, as well as the Sulina mouth of that river; several districts on the northeastern coast of the Black Sea, with their important fortresses; the confirmation of the protectorate of the Tsar over the Danubian principalities, and the confirmation to Russian subjects of the rights of trade in Turkey, and the freedom of navigation in the Black Sea, the Danube and the Dardenelles. See Adrianople.

Aix-la-Chapelle.— The first peace Treaty of Aix-la-Chapelle was signed 2 May 1668, when France, in accordance with the demands of the Triple Alliance (then composed of England, the Netherlands and Sweden), returned Franche-Comte to Spain in consideration of the cession of 12 fortified towns on the border of Spanish Netherlands. The second peace Treaty of Aix-la-Chapelle put an end to the famous war of the Austrian Succession. It was signed 18 Oct. 1748, and provided for the mutual restitution of conquests, except in the case of Austria, which was compelled to cede Parma, Guastalla and Piacenza to Don Philip of Spain, and to confirm the rights that Prussia had acquired in Silesia. See Aix-la-Chapelle, Treaties of Peace.

Alais.— The last of the religious wars in France was ended by the peace Treaty of Alais, which was signed in 1629. By its provisions the Huguenots ceased to exist as a political party.

Alkmaar.— It was in accordance with the provisions of the Convention of Alkmaar, signed October, 1799, that the Anglo-Russian forces under the command of the Duke of York, evacuated the Netherlands.

Altradstadt.— The treaty of peace, dictated by Charles XII of Sweden, and which cost Augustus II of Saxony his possession of Poland, was signed 24 Sept. 1706.

America.— See Paris, in this article.

Amiens.— The Peace of Amiens was concluded 27 March 1802. By the provisions of the treaty, which was between Great Britain on one side and France, the Batavian Republic and Spain on the other, the former agreed to recognize the Ionian Republic and to restore all conquests with the exception of Ceylon and Trinidad, on condition that France should abandon Rome and Naples and should restore Malta to the Knights of Saint John.

Ancon.— A treaty by the provisions of which Peru ceded important territories to Chile, was signed 20 Oct. 1883.

Antalcidas.— This treaty, which was signed by Antalcidas the Lacedæmonian with Artaxerxes, king of Persia, in 387 B.C., was made on behalf of Greece and in favor of Sparta. By its provisions the cities of Ionia passed to the Persians.

Antanarivo.— This treaty, signed 1 Oct. 1895, marked the conclusion of the troubles between France and the Hovas. By its provisions the French protectorate over Madagascar was established.

Antony and Octavius.— In B.C. 40, Antony and Octavius were compelled by their own soldiers to make a treaty of peace. It was signed at Brundisium, and was the means of postponing for fully 10 years the final struggle between the two chief triumvirs.

Augsburg.— While, in one sense of the word, a religious peace treaty, the agreement which was concluded between the Lutheran and Catholic state of Germany at Augsburg, 25 Sept. 1555, exerted an important political influence at that time. By the provisions of the treaty each state was permitted to prescribe the form of worship to be followed within its limits. This triumph of the Reformation, however, did not extend so far as to include the Calvinists.

Baden.— A treaty signed by the German Empire and France, 7 Sept. 1714. This, with the treaties of Utrecht and Rastadt, concluded that war of the Spanish Succession. By its provisions the Peace of Ryswick (q.v.) was ratified; the electors of Bavaria and Cologne were fully reinstated, and Landau was ceded to France.

Basel.— 5 April and 22 July 1795. See Basel, Treaties of Peace at.

Belgrade.— By this treaty signed between Turkey, Austria and Russia in September, 1739, Russia returned to Turkey her conquests in Moldavia and Bessarabia, and relinquished her naval rights in the Black Sea, while Austria renounced her territory in Wallachia, Bosnia and Serbia. See Belgrade.

Bergerac.— A treaty of peace, establishing liberty of conscience, was signed between the Catholics and Protestants at Bergerac, France, 17 Sept. 1577.

Berlin.— Treaty of 1742. See Breslau, in this article.

Berlin.— On 21 Oct. 1866, Saxony signed a treaty of peace with Prussia by the provisions of which she agreed to pay 10,000,000 thalers as indemnity to Prussia for the part her forces had played in the struggle known as the Seven Weeks War.

Biac-na-bato.— This treaty was signed by Aguinaldo, as leader of the Philippine insurgents, and Spain, 14 Dec. 1897. By its provisions he agreed that the insurgents would evacuate all positions and would maintain a three years' armistice in return for a stated cash consideration. The latter condition was never fulfilled.

Bordeaux.— A treaty of peace signed by Bouillon and his allies and Mazarine, after the siege of Bordeaux, in July 1650.

Breda.— By the Treaty of Breda, signed between England, Holland, France and Denmark, 31 July 1667, the rights of England in New York and New Jersey, of France in Arcadia, and of Holland in Surinam, were confirmed by the Powers.

Breslau.— The treaty signed at Berlin by Lord Hyndford, as representative of Maria Theresa, queen of Hungary, with Podewilz, Minister of Prussia, 28 July 1742, is known as the Peace of Breslau, owing to the fact that the preliminary convention was signed at that place on 11 June.

By the provisions of this treaty Silesia was ceded to Prussia by Austria.

Brest-Litovsk.— A treaty of peace between Germany, Austria-Hungary, Bulgaria and Turkey on the one part and "The Ukranian People's Republic" on the other part; signed 9 Feb. 1918.

Brest-Litovsk.— A treaty of peace between Germany, Austria-Hungary, Bulgaria and Turkey of the one part and Russia through the Bolshevik government of the other part, signed 4 March 1918. It was almost immediately renounced by several sections of the Russian people.

Bretigny.— This treaty known as "The Great Peace," was signed by Edward III of England and John II of France, 8 May 1360. See Bretigny.

Bromsebro.— By the provisions of the treaty of peace signed at Bromsebro, between Sweden and Denmark, in August 1645, the latter nation renounced its rights to rule over Jemtland, the island of Gothland, etc.

Bucharest.— This treaty, concluded 8 May 1812, ended the war which had been waged between Russia and Turkey since 1806. By its provisions the Pruth and the Lower Danube became the established boundary between these countries. See Bucharest, Peace of.

Bucharest.— The treaty of peace concluding the Second Balkan War, signed 10 Aug. 1913, by Rumania, Greece, Montenegro, Serbia and Bulgaria, defining the boundaries of Bulgaria and formally recording the latter's renunciation of all claims in the Isle of Crete.

Bucharest.— A peace treaty between Germany, Austria-Hungary, Bulgaria and Turkey on the one hand and Rumania on the other, signed 6 May 1918.

Callias.— A treaty concluded at Sparta, June 371 B. C., in which Athens and Sparta and all their allies participated. Callias, from whose name the treaty derived its title, was one of the most prominent Athenian envoys.

Cambrai.— A treaty signed between Francis I of France and Charles V, 5 Aug. 1559, by which France not only permitted Italy to revert to the emperor, but also relinquished all claims over Artois and Flanders, her rights to the duchy of Burgundy alone being recognized. This treaty is sometimes called the "Ladies' Peace," because of the fact that the preliminary negotiations were undertaken by Louise, the mother of Francis, and Margaret, aunt of Charles.

Campo-Formio.— A treaty signed between France and Austria, 17 Oct. 1797. It provided that Austria should cede the Belgian provinces and recognise the Cisalpine Republic, retaining, on the other hand, a large proportion of the Venetian territories, while France retained the Ionian Islands.

Carlowitz.— The Peace of Carlowitz will always be known as one of the most memorable treaties in history: (1) because of the magnitude of the territorial changes involved; (2) because it marked the beginning of the downfall of the Ottoman Empire as an aggressive power, and (3) because by taking part in a General Congress for the first time the sultan admitted the principle of intervention of the Powers for the general good. This treaty, which was for 25 years, was concluded 26 Jan. 1699, between Russia, Austria, Poland, Venice, and Turkey, by the mediation of England and the Netherlands. By its provisions Austria received that portion of Hungary lying between the Danube and Theiss, as well as Transylvania; Russia obtained Azoff; Venice retained the Morea, while Poland regained Podolia and Ukraine.

Cateau-Cambresis.— A treaty between England, France and Spain, signed 3 April 1559, by which the two latter countries restored many of their conquests.

Cherasco.— This treaty, signed 6 April 1631, confirmed the Treaty of Ratisbon which had been concluded between Richelieu and Ferdinand II, thus ending the War of the Mantuan Succession.

China and Japan.— The treaty signed between China and Japan, 16 April 1895, not only compelled China to pay a heavy indemnity, but required the cession of Formosa, the recognition of the independence of Korea and other concessions.

Cimon.— The Peace of Callias (q.v.) is sometimes known as the Peace of Cimon.

Clair-on-Epte.— A treaty signed about A.D. 911, between King Charles, Duke Robert of Paris and Rolf. By its provisions a definite district was ceded to Rolf, upon condition that he would become the king's vassal. After having been admitted to baptism the king's natural daughter was given him in marriage.

Conflans.— It was this treaty, signed in October, 1465 between Louis XI of France and the dukes of Burgundy, Bourbon and Brittany, which marked the conclusion of the War of the Public Good. By its provisions Normandy was ceded to the Duke of Berry.

Constance.— The peace treaty concluded by Frederick Barbarossa and the Lombard League in 1183, by which the cities of the League acknowledged the overlordship of the emperor upon his renouncement of the regalian rights which he had previously claimed.

Constantinople.— See Pruth 1711, in this article.

Constantinople.— By this treaty signed between Russia and Turkey, 8 Feb. 1879, the provisions of the Treaty of San Stefano (q.v.) were materially modified, and the sultan was compelled to pay a heavy war indemnity.

Constantinople.— The treaty of peace, signed between Turkey and Greece in December, 1897, officially concluded the Greek War.

Crepy-en-Laonnais.— By this treaty, signed between Francis I of France and Charles V, the emperor renounced all claims to Burgundy, while Francis renounced all rights in Lombardy, Naples, Flanders and Artois.

Dennikon.— The peace treaty that was signed at Dennikon in 1531 established the principle of each canton's independence.

Dresden.— The Peace of Dresden concluded the second Silesian War. It was signed between Austria, Saxony and Prussia, 25 Dec. 1745, and its provisions confirmed Frederick the Great in his contention for the possession of Silesia.

Dyrrachium.— The first Macedonian War, which began in 214 B.C. was concluded by the Peace of Dyrrachium signed 205 B.C. This peace was of five years' duration.

El Zanjon.— Peace was declared between the Spanish forces and the Cuban revolutionists in 1878, when the Treaty of El Zanjon was signed. According to the provisions of the treaty General Gomez disbanded his army and retired to San Domingo, but the reforms which Spain had promised in return never materialized. As the result the standard of revolt was once more raised in 1895.

Evora Monte.— The treaty of Evora Monte concluded the attempt of Dom Miguel to capture the throne of Portugal. By its provisions he abandoned his claim to the crown in consideration of a pension of $60,000 per annum.

Falaise.— The engagement of fealty to Henry II taken by William the Lion, king of Scotland, in 1175, is generally known as the Treaty of Falaise.

Fleix.— This treaty of peace which was concluded between Henry III of France and the Huguenots, 26 Nov. 1580, was little more than a renewal of the Treaty of Bergerac (q.v.).

Foligno.— By the truce of Foligno, concluded between Napoleon and the King of Naples, February, 1801, the later ceded part of the island of Elba and abandoned all rights in Tuscany.

Fommanah.— A treaty of perpetual peace was concluded between Great Britain and the Ashantees, 13 Feb. 1874. By its provisions an indemnity of 50,000 ounces of gold was paid, supremacy over Adansi and other tribes was renounced, free trade was guaranteed and human sacrifices were abandoned.

Fontainebleau.— The preliminary convention of peace between Great Britain, France, Spain and Portugal, was signed at Fontainebleau, in 1762.

Fontainebleau.— The peace between the emperor and the Dutch was concluded 8 Nov. 1785. By its provisions the emperor, in lieu of 10,000,000 guilders, renounced his claims to the free navigation of the Schelde outside of his own domain, and all pretensions to Maescricht, etc.

Friburg.— A perpetual peace was negotiated between France and the Swiss cantons at Friburg, 29 Nov. 1516.

Fuessen.— By this peace treaty, concluded between Queen Maria Theresa of Hungary, and the Elector of Bavaria, 22 April 1745, the latter renounced all claim to the imperial crown in return for his lost territories.

Ghent.— The treaty of peace between the United States and Great Britain, which concluded the War of 1812, was signed at Ghent, 24 Dec. 1814. Its provisions included the mutual restitution of conquered territory, and the appointment of a commission to settle the boundary dispute, and matters relating to islands in Passamaquoddy Bay. See Ghent, Treaty of.

Greenville.— The peace concluded between "Mad Anthony" Wayne and the Northwestern Indians, 3 Aug. 1795. The treaty, which made cession of an extensive territory to the Union, also guaranteed the safety of all settlers. See Greenville, Treaty of.

Guadalupe-Hidalgo.— The treaty of peace which concluded the war between the United States and Mexico was signed 2 Feb. 1848. It fixed the boundary line between the two republics, and, by its provisions, the United States paid to Mexico $15,000,000 for the territory which it gained by the new boundary, and also relieved Mexico from all claims of citizens of the United States for damage, agreeing to pay the same to the amount of $3,250,000. See Guadalupe-Hidalgo, Treaty of.

Guerande.— The civil war which established Montfort as Duke of Brittany was concluded by the Peace of Guerande, signed in 1365.

Guines.— The war between Henry VIII and Francis I of France was terminated by the Treaty of Guines, signed in 1547. By its provisions Boulogne, which had been taken by the English, was restored to the French upon receipt of an indemnity of 2,000,000 gold crowns.

Hague.— The treaty of peace between Spain, Savoy and Austria was concluded at The Hague, 17 Feb. 1717.

Hamburg.— The Treaty of Hamburg was concluded between Russia and Prussia, 5 May 1762.

Hodeiba.— The truce of Hodeiba was extorted from the Koreish by Mahomet in 628. As the result of its provisions hostilities were suspended for 10 years.

Hubertsburg.— The Peace of Hubertsburg, which terminated the Seven Years' War, was signed by Prussia, Austria and Saxony at the castle of Hubertsburg, 15 Feb. 1763. By its provisions Prussia retained Silesia.

Jassy.— The Treaty of Jassy, concluded between Russia and Turkey, in 1792, extended the Russian borders to Dniester and gave to her the coast on which the city of Odessa soon arose.

Kainardji.— See Kutschuk Kainardji, in this article.

Karlowitz.— See Carlowitz, in this article.

Kiel.— By the treaty of peace signed at Kiel, 14 Jan. 1814, Denmark ceded Helgoland to Great Britain and Norway to Sweden, receiving Swedish Pomerania and Rugen as exchange from the latter.

Kimon.— See Callias and Cimon, in this article.

Kutayah.— By the treaty of peace signed here in May 1833, Turkey ceded Syria and the province of Adana to Ibrahim Pasha.

Kutschuk Kainardji.— By this treaty of peace signed between Russia and Turkey, 21 July 1774, the sultan renounced his sovereignty over the Tartars in southern Russia and granted other territories and strategetical points in the Crimea and on the Black Sea.

Ladies' Peace.— See Cambrai, in this article.

La Rochelle.— The treaty by which Charles IX granted partial toleration to the Protestants, 6 July 1573, is known as the Peace of La Rochelle.

Lausanne.— The treaty of peace signed by Italy and Turkey, 8 Oct. 1912, by which Tripolitana and Cyrenaica were ceded to Italy.

Leoben.—A provisional treaty of peace concluded between Napoleon I and the Austrians, 18 April 1797. By secret provisions Napoleon promised to exchange the greater part of the mainland territory of Venice for the Netherlands. Its terms were modified by the Treaty of Campo-Formio (q.v.).

Lisbon.— The successful revolution of Portugal against Spain was officially terminated by the conclusion of the Treaty of Lisbon, 13 Feb. 1668. Although this treaty recognized the independence of Portugal, it provided for the cession of Ceuta to Spain.

Lodi.— The war of Milan and Florence with Venice, Naples and other states ended with the signing of the treaty of peace at Lodi, 9 April 1454.

London.— The treaty of peace closing the First Balkan War, signed 17–30 May 1913 by Greece, Bulgaria, Montenegro and Serbia, of the first part, and Turkey, of the second part. By this treaty Turkey ceded a large part of its territory in Europe, and the Isle of Crete, and confided to the monarchs of the neutral governments of Europe the disposition of the remainder of the Ottoman islands in the Ægean Sea, and the Peninsula of Mount Athos.

Longjumeau.— A treaty of peace between the Catholics and Protestants was signed at this town in France, 23 March 1568. Peace was of brief duration, however, as war was under way again within six months.

Lubeck.— A peace signed between Wallenstein, for Germany, and the Danes, January 1629. In accordance with its provisions the Danes recovered all their former possessions, without the payment of indemnity. They were merely compelled to pledge themselves never again to interfere with the affairs of the empire.

Lund.— The treaty between Denmark and Sweden, adjusting the difficulties that had led them to participate in the War of 1672 between France and Holland was negotiated at Lund, 26 Sept. 1679.

Luneville.— Historians have always held that the Peace of Luneville was especially distinguished in that it marked the beginning of the end of the Holy Roman Empire. It was a treaty concluded between the emperor and the French, 9 Feb. 1801. By its provisions the Batavian, Cisalpine, Helvetic and Ligurian republics were recognized; the left bank of the Rhine was bestowed upon France; Tuscany was ceded to Parma, and the arrangements made with Austria by the Treaty of Campo-Formio were confirmed.

Mangalore.— The treaty of peace by which the British and Tippu Saib agreed to a restitution of conquests was signed at Mangalore, India, in 1784.

Mersen-Rastadt.— See Rastadt, in this article.

Milan.— The treaty of peace between Austria and Sardinia was concluded at Milan, 6 Aug. 1849.

Monsieur.— The treaty forced upon Henry III of France by a powerful combination of Huguenots and "Monsieur," the Duc d'Alencon, and whereby great concessions were made to the Huguenots, has since been known as the Peace of Monsieur. It was signed in 1576.

Montpellier.— A treaty of peace which was extremely unfavorable to the Huguenots was signed at the close of the siege of Montpellier, in 1622.

Montpellier.— The second Treaty of Montpellier, which offered more tolerable terms to the reformers, was signed in 1626.

Monzon.— A treaty of peace between France and Spain was signed at Monzon in May, 1626. The negotiations were conducted so quietly that the interested parties (Savoy, the Grisons, the Venetians, etc.) knew nothing about the matter until their fate had been settled by the treacherous cardinal, Richelieu.

Munster.— The general peace which ended the Thirty Years' War was signed at Munster, 24 Oct. 1648. See also Westphalia, in this article.

Nanking.— Great Britain and China concluded a treaty of peace which terminated the so-called "Opium war," in 1842. By its provisions China was not only compelled to pay an indemnity, but was forced to cede Hongkong to Great Britain, and to open the ports of Canton, Amoy, Fuchow, Ningpo and Shanghai to British commerce.

Nantes.— The Edict of Nantes, issued by Henry IV of France, 13 April 1598, is also known as the Peace of Nantes, owing to the fact, that it put an end to the religious wars in France. See Edict of Nantes.

Naupactus.— The conflict known as the "Social War" waged between the Achæan League, in alliance with Philip of Macedonia, and the Aetolian League, in combination with Sparta, was terminated by the Peace of Naupactus, B.C. 217.

Nice.— A truce famous in history was concluded at Nice between Charles V and Francis I of France, in 1538.

Nicias.— The famous truce negotiated by Nicias during the Peloponnesian War, between the Athenians and Sparta, B.C. 421, has since been known as the Peace of Nicias.

Nikolsburg.— The preliminary peace terms, which were afterward confirmed by the Peace of Prague (q.v.), were negotiated at Nikolsburg, a town in Moravia, 26 July 1866. These terms acted as a truce in the war between Prussia and Austria.

Nimeguen.— See Nimwegen, in this article.

Nimwegen.— A number of treaties were concluded at Nimwegen, Netherlands, during 1678 and 1679. With subsequent treaties, including that of Westminster (1674); Fontainebleau (1679); Lund (1679); Saint Germaine-en-Laye (1679), etc., they succeeded in terminating the war between France and Holland, and their allies, which had been in progress since the attack of Louis XIV upon Holland, in 1672. The treaties signed at Nimwegen were as follows: Between France and Holland, 10 Aug. 1678; between France and Spain, 17 Sept. 1678; between the emperor and France and Sweden, 5 Feb. 1679; between Holland and Sweden, 12 Oct. 1679. By the provisions of the treaty all territories taken were restored to Holland upon her pledge of future neutrality; France and Spain exchanged some extensive territories; the emperor ceded Frieburg-im-Breisgau to France, and Charles IV, Duke of Lorraine, was restored to his duchy upon conditions to which he refused to give his assent. See Nimwegen.

Northampton.— The treaty of peace by the provisions of which Edward III of England renounced all claims of dominion which had been assumed over the kingdom of Scotland was concluded with King Robert I, 4 May 1328.

Noyon.—The wars that arose from the League of Cambray were terminated by the treaty of peace signed by Francis I of France, Charles of Spain, Maximilian, the emperor, etc., 3 Dec. 1516.

Nuremberg.— The religious truce concluded between Emperor Charles V and the Protestants, 2 Aug. 1532, is known as the Peace of Nuremberg.

Nystad.— The Northern War between Russia and Sweden was terminated by the Peace of Nystad, concluded 30 Aug. 1721. By its terms Russia restored Finland, but received, in place of it, extensive territories, including Esthonia, Livonia, Ingria, part of Karelia, etc.

Oliva.— Sweden, Poland, the Empire and Brandenburg participated in the peace treaty which was concluded at Oliva, Prussia, in 1660. By renouncing Courland, Sweden obtained important concessions from Poland.

Olmutz.— The Olmutz Conference between Prussia, Austria and Russia, 29 Nov. 1850, put an end to the revolts in Hesse and Schleswig-Holstein. The Elector of Hesse was reinstated and Schleswig-Holstein was restored to Denmark.

Osnabruch.— See Westphalia, in this article.

Paris.— There have been many so-called treaties of Paris. See Paris, Treaties of. The following are the most important peace treaties:

1763.— A peace treaty was signed at Paris, 10 Feb. 1763, between Great Britain on one side and France, Portugal and Spain on the other. By its provisions Great Britain received Canada, Prince Edward Island, Cape Breton, Dominica, Tobago, Saint Vincent, Grenada, Mobile and all the territory east of the Mississippi from France, restoring to her in return Guadalupe, Miquelon, Martinique, Pondicherry and Saint Pierre, and ceding to her Saint Lucia. In return for Florida Great Britain restored Havana and ceded Louisiana to Spain.

1783.— The Peace of Paris, which terminated the Revoluntionary War, was signed between Great Britain on one side and the United States, Spain, and France on the other, 3 Sept. 1783. In addition to the acknowledgment of the independence of the United States the treaty provided that the navigation of the Mississippi should be made free to all parties to the agreement; that Florida and Minorca should be restored to Spain; that France should control the region of the Senegal, etc.

1814.— The treaty popularly known as the "First Peace of Paris," was concluded between France on one side and Great Britain, Austria, Prussia and Russia on the other, 30 May 1814. In addition to acknowledging the independence of the Netherlands, Switzerland, and the German and Italian states, many territorial changes were made, both by the treaty and at the Congress which met later at Vienna.

1815.—This treaty, known as the "Second Peace of Paris" was concluded between the same parties as the treaty of 1814, having been signed 20 Nov. 1815. By its terms France was reduced pratically to the limits of 1790; the sum of $1,400,000,000 was assigned as proper recompense to the allies for the expenses of the war, and, among other things, it was agreed that the fortresses of the northern frontier should not only be occupied by the allies for a term of five years, but that such garrisons should be paid by France.

1856.— By the Peace of Paris, concluded between Russia on one side and Turkey, Great Britain, France, and Sardinia on the other, 30 March 1856 Russia abandoned her claim to a protectorate over the Christians in Turkey, the neutralization of the Black Sea was proclaimed and several important territorial changes were made.

1898.— The most recent Peace of Paris was concluded between the United States and Spain, 10 Dec. 1898. According to its terms Spain relinquished her sovereignty over Cuba, and ceded Porto Rico, Guam and the Philippine Islands to the United States in return for the payment of $20,000,000.

Passarowitz.— By the Treaty of Passarowitz, concluded 21 July 1718, between Turkey and Austria and Venice, Venice ceded the Morea to Turkey, while Turkey ceded a large tract of territory, including Bosnia and part of Serbia, to Austria.

Passau.—A treaty concluded between the Elector Maurice of Saxony and King Ferdinand in behalf of Emperor Charles V. This agreement, granting freedom of religion to the Lutherans, was signed 16 July 1552.

Peace of Monsieur.— See Monsieur, in this article.

Peking.— The Peace of Peking, concluded between China and Great Britain and France, Oct. 1860, provided for the ratification of the Treaty of Tientsin (q.v.), and arranged the payment of indemnities and other concessions on behalf of China.

Perpetual Peace, The.— See Friburg, in this article.

Persia.— The treaty of peace between Great Britain and Persia, at the conclusion of the war over the taking of Herat, was signed at Teheran, 14 April 1857.

Petersburg, Saint.— See Saint Petersburg, in this article.

Pinerolo.— An agreement reached between the English Commonwealth and France, 1655, by which further persecution of the Waldenses by the Duke of Savoy was permitted.

Pleswitz.— Although finally signed at Poischwitz, the armistice between Napoleon and the Russian and Prussian sovereigns, concluded 1 June 1813, is usually known as that of Pleswitz, owing to the fact that the negotiations were chiefly conducted at that place.

Portsmouth.— The treaty of peace between Japan and Russia, conducted through the mediations of the United States, was concluded 5 Sept. 1905, at Portsmouth, N. H. See Portsmouth, Treaty of.

Prague.— The first Treaty of Prague was concluded between Ferdinand II, emperor, and the Elector of Saxony, in 1635. By its terms the latter assumed control over Lusatia.

Prague.— By the second Treaty of Prague, concluded between Prussia and Austria, 23 Aug. 1866, the Lombardo-Venetian kingdom was annexed to Italy and the Germanic Confederation was dissolved.

Presburg.— The Peace of Presburg was concluded between France and Austria, 26 Dec. 1805. By its terms Austria ceded her Venetian territories to Italy; Tyrol, Passau, etc., to Bavaria, and her Swabian territories to the South German States. Bavaria and Wurtemburg were also made kingdoms.

Pretoria.— The treaty of peace that put an end to the South African War was concluded at Pretoria, 31 May 1902. By its terms Great Britain took possession of the Transvaal Republic, the Orange Free State, etc.

Pruth.— The Peace of Pruth, which is also known as the Treaty of Falczi, was concluded at Hush, between Russia and Turkey, 23 July 1711. By its provisions Peter the Great and his army were released from the blockade; and Charles XII of Sweden was permitted to return home without being molested, in return for territorial cessions made by Russia to Turkey.

Pyrenees.— The treaty of peace concluded between France and Spain, November 1659, not only arranged for the cession of considerable Spanish territory to France, but also provided for a marriage between Maria Theresa, Infanta of Spain, daughter of Philip IV, and Louis XIV of France.

Rastadt.— The agreement for the termination of the war between Austria and France was reached at the Congress of Rastadt, in 1714.

Rastadt.— The treaty known as the Peace of Rastadt was the agreement which preceded the treaty of Baden (q.v.). It was concluded between France and Austria, 6 March 1714.

Reuil.— The treaty of peace between the French Parliment and the Court, at the conclusion of the " First Fronde," was signed at Reuil in 1649.

Roeskilde.— By the Treaty of Roeskilde, concluded 28 Feb. 1658, Denmark ceded Schonen, Halland, Bornholm and Drontheim to Sweden.

Ryswick.— The Treaty of Ryswick, concluded between France on one side and England, the Netherlands and Spain on the other, 21 Sept. 1697, marked the end of French support of the Stuarts by the recognition of William III as king of England. Many conquests were restored and several territorial exchanges were made.

Saint Germain-en-Laye.—The peace Treaty of Germain-en-Laye was concluded in 1679 between France and Brandenburg. By its terms Brandenburg was compelled to cede the greater part of its Pomeranian conquests to Sweden.

Saint Petersburg.— The peace treaty between Russia and Prussia, by the terms of which the former restored all her conquests to the latter, was concluded 5 May 1762.

San Ildefonso.— The treaty of peace which concluded the revolution of La Granja was signed at the castle of Ildefonso in August 1836. By its terms Queen Maria Christina of Spain was compelled to restore the Constitution of 1812.

San Stefano.— A treaty of peace concluded between Russia and Turkey, 3 March, 1878. By the terms of this agreement, which terminated the Russo-Turkish War the independence of Rumania, Serbia and Montenegro were recognized; the principality of Bulgaria was created, while Russia was to receive important territorial cessions as well as a war indemnity of 300,000,000 rubles. This treaty was much altered by the Congress of Berlin which met in the following June. See Adrianople; San Stefano, Treaty of.

Sardinia.— The agreement by which Sardinia consented to assist Great Britain and France by providing a military contingent to serve against Russia in the Crimean War is known as the Sardinian Convention.

Schonbrunn.— A treaty concluded between Napoleon I and Prussia, by which the latter ceded Cleves, Ansbach and Neuchatel to France. It was signed 15 Dec. 1805.

Schonbrunn.— The second treaty signed at Schonbrunn is also known as the Treaty of Vienna. It was concluded 14 Oct. 1809, between Napoleon I and Francis I of Austria; its terms provided that Austria should not only join the Continental system and pay a war indemnity, but that she should cede territories to Bavaria, Warsaw, Russia and France. Those ceded to France were formed under one government, the Illyrian Provinces, by Napoleon.

Serpul.— The Peace of Serpul, between the Russians and the Bokhariots, was concluded in 1858. By its terms the Emir pledged himself to remain a firm ally of Russia. Valuable territorial concessions were also made.

Seville.— A peace between Great Britain, Spain and France, concluded in 1729. It was this treaty that left Great Britain in possession of Gibraltar.

Shimonoseki.— The treaty of peace concluded between China and Japan 17 April 1895, and by the terms of which China agreed to recognise the independence of Korea, ceded to Japan the southern portion of the province of Shingking, the island of Formosa and the Pescadores; pay a war indemnity of about $175,000,000, and open the ports of Shashih, Chungking, Hangchow and Suchow.

Sistova.— A treaty of peace concluded between Turkey and Austria, 4 Aug. 1791. The boundaries which were adopted under the provisions of this treaty were very similar to those of the Treaty of Belgrade.

Spain with America.— See Paris, 1898, in this article.

Stockholm.— A treaty concluded between Great Britain and Sweden by the terms of which the duchies of Bremen and Verden were ceded to George I as Elector of Hanover, in consideration of the payment of 1,000,000 rix-dollars.

Szathmar.— By the terms of the Peace of Szathmar, concluded between Karoly and Hungary, in 1711, the emperor agreed to redress all grievances, both civil and religious, besides promising amnesty to all adherents of Rakoczy's, and the restitution of many of the confiscated properties.

Szegeddin.— The treaty of peace which Hunyades extorted from the sultan of Turkey rescued a large Christian territory from the Moslem yoke. It was concluded 12 July 1444.

Tafna.— The peace signed between General Bugeaud, for France, and Abd-el-Kader, 30 May 1837, is known as the Treaty of Tafna.

Teschen.— The peace which ended the War of the Bavarian Succession was concluded at Teschen, between Austria and Prussia, 13 May 1779.

Thorn.—Two peace treaties have been concluded at Thorn between Poland and the Teutonic Order. The first treaty was signed in 1411; the second, in 1466. By these treaties the Order made important cessions to Poland.

Tien-Tsin.— A treaty concluded between China on one side and the United States, Great Britain, France and Russia on the other, 26 June 1858.

Tilsit.— The peace between France on one side and Russia and Prussia on the other was concluded at Tilsit in 1807. The treaty between France and Russia was signed 7 July, that between France and Prussia on 9 July of that year. By the terms of the peace a portion of Prussia was set aside as the grand duchy of Warsaw, another portion of Prussia was ceded to Russia, and a smaller portion to Saxony; Dantzig was made free; Prussian harbors were closed to the trade of Great Britain; the Prussian army was reduced to 42,000 men and the Confederation of the Rhine and Joseph, Louis and Jerome Bonaparte were recognized. Russia, on her part, entered into a secret alliance with France.

Tolentino.— By this treaty concluded between Pope Pius IV and Napoleon, the pontiff ceded Avignon, Bologna, Ferrara, the Comtat-Venaissin, the Romagna and Ancona to France. The agreement was signed in February 1797.

Turin.— A peace between France and Savoy was concluded at Turin in 1696.

Turin.— The armistice negotiated between Bonaparte and Sardinia in 1796 is known as that of Turin.

Turkmauchay.— By the terms of the peace treaty concluded between Russia and Persia in 1828, Russia acquired, among other cessions, control over Persian Armenia.

Ulm.— The armistice concluded in 1647 between the French and Swedish forces on one side and the Bavarians on the other has since been known as the " Truce of Ulm."

Unfortunate Peace.— This title is frequently applied to the Treaty of Cateau-Cambresis (q.v.).

Utrecht.— The Peace of Utrecht, which consisted of several separate treaties, was concluded in 1713 between France on one side and Great Britain, Holland, Portugal, Prussia and Savoy on the other. With the treaties signed later at Rastadt and Baden it terminated the War of the Spanish Succession, for, by its provisions, it stipulated that the crown of Spain, which should never be united to that of France, should revert to Philip V of Bourbon. The Protestant succession in England and Prussia's rights as a kingdom were also recognized. Among the several territorial changes, Great Britain received Newfoundland, Nova Scotia, etc., with the right to send African slaves to America; the Spanish Netherlands, Sardinia, Milan and Naples were ceded to Austria; Sicily was given to Savoy by Spain; Portugal received additional territories in South America, while Prussia took Neuchatel and Gelderland upon the renouncement of its claims upon Orange. See Utrecht, Peace of.

Verdun.— The conflict between the sons of Louis the Pious, immediately succeeding his death, was the first great dynastic quarrel of modern Europe. By the Treaty of Verdun, the agreement of partition which followed the battle of Fontenay, in 843, the Teutonic principle of equal division among heirs triumphed over the old Roman principle which provided for the transmission of the individual empire.

Vergara.— The treaty between the Carlists and the Cristinos, in Spain, was terminated by a treaty concluded at Vergara 1 Aug. 1839.

Versailles.— The preliminary agreement which preceded the peace of Frankfort (q.v.) was concluded between France and Germany at Versailles, 26 Feb. 1871. See Versailles. For the Peace Treaty 1919, see War, European.

Vienna.— Several treaties have been concluded at Vienna. Those of the greatest importance are as follows:

1725.— A treaty between Germany and Spain, concluded 30 April 1725. By its terms the two sovereigns confirmed to each other such portions of the Spanish dominions as were then in their possession, while Spain guaranteed the Pragmatic Sanction. By a secret treaty signed at the same time Germany agreed to endeavor to restore Gibraltar to Spain, and to use effort to place the pretender on the throne of Great Britain.

1738.— A treaty between Charles VI of Germany and Louis XV of France, concluded 18 Nov. 1738. By its terms Austria ceded the Two Sicilies to Don Carlos of Spain, receiving the duchies of Parma and Piacenza in return; Lorraine was ceded to France, and the Duke of Lorraine received Tuscany. It was this agreement that terminated the War of the Polish Succession.

1864.— The treaty which ended the Schleswig-Holstein War was concluded between Austria and Prussia on one side and Denmark on the other, 30 Oct. 1864. By its terms the king of Denmark renounced all rights over Schleswig-Holstein and Lauenburg.

1866.— The treaty of peace between Austria and Italy, by the terms of which the former gave up Venetia to Italy, was concluded 3 Oct. 1866.

Villafranca.— The war of 1859 between France and Austria was brought to an end by the treaty signed at Villafranca by Francis Joseph and Napoleon III, 11 July 1859. This treaty was preliminary to that of Zürich (q.v.).

Wedmore.— A treaty of peace concluded between King Alfred and the Danes (about 860) by which the latter bound themselves to remain peacefully on that side of England which lay north and east of " Watling Street."

Werela.— A treaty of peace was concluded between Sweden and Russia, at Werela, Finland, in 1790.

Westminster.— By the Treaty of Westminster, signed 19 Feb. 1674, the United Provinces relinquished their conquests of the New Netherlands to the king of England.

Westminster.— The so-called " Peace of Westminster," signed by France and England 13 Oct. 1655, admitting the freedom of the neutral flag.

Westphalia.— The Peace of Westphalia, which terminated the Thrity Years' War, consisted of treaties signed at Munster and Osnabruk, the general peace being signed at Munster, 24 Oct. 1648. By its provisions Switzerland and Holland were declared independent of the German Empire; Sweden obtained Hither Pomerania, Wismar, etc., with three votes in the Diet and a cash indemnity; France received most of Alsace, and was confirmed in the possession of other territories; Brandenburg received Further Pomerania, etc.; Lusatia went to Saxony; the Upper Palatinate to Bavaria; the Rhine Palatinate reverted to the electoral house of the Palatinate, a new electorate being created for it; the Peace of Augsberg was confirmed (its provisions being also extended to the Calvinists) and autonomy was secured to the German States. See Westphalia, Peace of.

Znaim.— The truce between France and Austria which followed the battle of Wagram 12 July 1809, has since been known as the " Armistice of Znaim."

Zürich.— The Peace of Zürich was concluded between France and Sardinia on one side and Austria on the other, 10 Nov. 1859. Based on the preliminary treaty signed at Villafranca (q.v.), its terms provided that Austria should cede Lombardy (except Mantua and Peschiera) to France, she ceding them to Sardinia. In return Sardinia assumed responsibility for three-fifths of the debt.

PEACH, a small tree (*Amygdalus persica*) of the family *Amygdalaceæ*. It is supposed to be a native of China, whence it has been carried by man, by way of southwestern Asia and the Mediterranean region, to all warm temperate climates throughout the civilized world. It has been cultivated since prehistoric times and to-day it ranks among the 12 most important fruits of the world. The original species is not identifiable, and many botanists suppose that originally the peach and the almond were identical. The two trees are much alike in habit and appearance, and many intermediate grades of their fruit are known. The peach attains heights of 15 to 20 feet, bears lanceolate leaves singly, in pairs or threes, in the last case two of the buds usually being flower-buds with a leaf-bud between them. Flower-buds are also borne upon short spurs which live only two or three years. Since the flower-buds open in very early spring, before the leaves appear, they are frequently injured by frost. The fruits (drupes) vary greatly in size, downiness, color, adherence to or separation from the stone and color of flesh.

About 300 varieties are cultivated in the United States, popularly classed as clingstone and freestone, white-fleshed and yellow-fleshed. Price, a Texas horticulturist, has given a systematic classification as follows: (1) Peen-to race, flat, greenish-white, medium-sized, early varieties, suitable for cultivation only in the Gulf States; (2) South China race, flattened-oval, rather small fruits with curved apex; (3) Indian or Spanish race, hairy, yellow, late, often streaked, firm fruits; (4) North China race, large, mostly cling or semi-cling fruits with slightly curved beaks; (5) Persian race, the common peaches, white or yellow-fleshed, cling or free, of the Northern and Central States, also cultivated extensively in Georgia, California and other great peach-producing districts. There are also smooth-skinned peaches, nectarines, which may originate from peach seeds, or from sport-buds upon peach trees, and are propagated and cultivated in the same way as peaches, but to only a small extent commercially.

Peaches are always propagated by means of seeds, which are usually stratified in sand during the autumn, and allowed to freeze during the winter in order to crack the shells and thus hasten germination. The seeds are planted in light soil six or eight inches asunder in rows two and one-half or three feet apart. The young plants are cultivated like other intertilled crops until they are large enough to be budded with the desired varieties. This is usually in June in the South, and from early

A TYPICAL PEACH BRANCH

August to mid-September in the North. In the South the trees may be ready for setting in the orchard during the autumn; in the North the buds do not grow until the following spring and the trees are not ready for planting until the succeeding autumn. In the operation of budding the buds are set as close to the ground as the operator can place them, and when they start to grow the original top is removed so as to force all the food into the young sprout. When set in the orchard the young trees is buried at least as deeply as the point of union of stock and scion. Peach trees more than one year old from the bud are rarely planted because they are less satisfactory than yearling trees.

The peach will succeed upon almost any soil if not too wet; it thrives best, however, upon light, sandy, gravelly or shaly soils, where the fruits are superior in color and flavor to those produced on heavier soils, though these latter may yield more succulent fruits. Heavy lands have a further disadvantage since they generally induce late and rank growths, which are not only at the expense of productivity but are very prone to be winter-killed. The inferior color of fruits on such land can be partially corrected by distant planting, and by admitting light and sun to the trees by open pruning. More important than soil is situation. Since the blossom-buds open very early, the peach orchard should be situated on a northern slope, preferably on high ground where the coldness of the air will counteract the sun's warmth on thawing winter days and in early spring. The later they can be made to open, the better. For this purpose many growers spray their trees in early winter with whitewash so that the twigs will reflect rather than absorb the sun's rays. Nearness to large bodies of water is always desirable if the prevailing wind during winter and spring comes from that direction. The most successful peach areas in the North are on the eastern shore of Lake Michigan and the southern shores of Lakes Erie and Ontario.

In the orchard the trees are planted about 20 feet apart, though upon very light soils, and when given special care as to pruning and tilling they may be set even 12 feet apart. Usually in such cases, however, each alternate tree is removed when the branches commence to interfere with one another. The land is deeply plowed and harrowed either in early spring or autumn, and the trees set in rectangles or hexagons, the latter being preferred in California because a larger number of trees can be planted on a given area and the land can be kept cleaner, since it may be cultivated in three directions instead of two. In arid and semi-arid regions the orchards are irrigated. In regions where there is danger of late growth, they are sown with crimson clover, rye or some other cover crop, to check growth and thus ripen up the branches already formed. In the following spring this crop is plowed under. Care must be taken, however, to prevent the undue accumulation, by this practice, of nitrogenous plant-food in the soil, and for this reason also nitrogenous fertilizers must usually be withheld, since such tend to produce rank growth of tender wood. Potash and phosphoric acid fertilizers may be applied without stint. At planting time the trees must be severely cut back, only a small part of the main stem and one or two buds upon the best placed twigs being allowed to remain. In subsequent seasons the twigs must be severely pruned back, usually less than half the wood produced being allowed to remain and often two-thirds being removed. Pruning should occur in the spring just as the buds are swelling, since at this time those that are living can be easily distinguished and the pruning done most judiciously. Summer pruning is rarely done, but thinning the fruit is a general practice. This operation is performed after the "June drop," when the imperfectly set fruits fall off. Many growers remove more than half the fruits set; others insist that the remaining fruit be from 5 to 10 inches apart. This practice results in a saving of plant-food and consequent annual productivity. It also increases the size and quality of the specimens. Even under the best of management the trees will seldom live much longer than 25 years, and in commercial orchards they rarely exceed 10 years of profitable service, having come into profitable bearing when three or four years old.

With perhaps no other fruit did methods of marketing change so radically during the closing half of the 19th century as with the peach. In the fifties the fruit was generally sent to market in large baskets or even piled loosely in wagons. Now, although half bushel baskets are still used to some extent, small packages are the rule, a favorite package being a crate containing six veneer baskets each holding two or four quarts. Another popular package is the climax basket holding from 5 to 10 pounds, provided with a handle, and covered with netting or a thin board. The fruit is gathered while still firm but when full grown and well colored. Enormous quantities of peaches are used as dessert and still larger amounts are canned or dried. In some sections peach brandy is also made upon a small commercial scale.

The peach is the victim of several insidious and inexplicable so-called diseases, as well as of several whose origin, life-history and control have been fairly well worked out. Probably the most widely dreaded of the first group is yellows. This malady attacks all varieties of peaches, of all ages and on all kinds of soils. It appears on the tree, first as a tip growth late in autumn or before general growth in spring, the tips of twigs and especially of water-sprouts and suckers when present being most often attacked. The small, stiff, narrow leaves of these growths stand approximately at right angles to the short stem. The second symptom is slender, the appearance of wiry shoots with stiff leaves developed on the trunk and main branches. Often these form tufts. Finally slender growths of new wood bearing small, narrow yellow or reddish leaves, appear often in great abundance in the centre of the tree. An infallible sign after the trees are in fruit is the red splotched fruit, the flesh of which is usually mottled red. Premature ripening of the fruit is common and decrease of size and increased fuzziness mark the second year's crop. Since no remedy has been discovered, and since the disease is considered contagious, the trees should be dug out and burned as soon as possible. New trees may be planted where the old ones have stood. The disease is purely American, and has been known for over a century. . Trees rarely live more than five years after being attacked. It is more prevalent in Northern than in Southern orchards.

During the closing decade of the 19th century a new inexplicable disease called "little peach" appeared in the peach belt of Michigan and in western New York. The fruits continue small and hard, the trees decline in vigor and die in a few years. No remedy has been discovered, and as the affection is contagious, grubbing and burning must be enforced.

Of the controllable diseases the following are the more common and destructive if unchecked. Fruit-rot or twig-blight (*Monilia fructigena*) destroys the young twigs and foliage, especially in the centre of the tree. It is most commonly recognized by the rotting of the fruits, which may hang as "mummy" peaches for a year or more after they have destroyed the specimen. Since these mummies are sources of infection they should be gathered and burned. Further treatment consists in spraying the dormant trees in very early spring with a copper-sulphate solution (1 pound to 25 gallons of water). When the buds commence to swell, an application of Bordeaux mixture diluted to 75 gallons should be given and another when the buds open. Other sprayings should be given as the fruit approaches maturity, a clear fungicide being used. Thinning of the fruit and the admission of light and air bv open pruning are helpful preventive measures. Leaf-curl (*Exoascus deformans*) seems to have a pronounced liking for some varieties, especially soft, dark-leaved ones. The leaves become wrinkled, yellowish or reddish and contorted, but are at first only somewhat blistered. It appears in spring, particularly in moist weather, and may defoliate the trees by midsummer, though slight attacks seem to do no marked injury. Spraying before the blossoms open, as recommended above, and once after they fall, has been found effective. If the weather is dry and clear the last mentioned application may be omitted. Black spot (*Cladosporium carpophilum*) appears as dusky dots upon the fruit, especially in damp atmosphere. Their confluence often checks the development of the part attacked and the fruit may crack open or be lop-sided. Spraying as for fruit rot has been found satisfactory. See FUNGICIDES.

Among the numerous insects which feed upon the peach the following are often troublesome: Peach twig borer, the larva of a European moth (*Anarsia lineatella*). It passes the winter as a larva, and in the spring burrows into the growing shoots, which fail to develop. It has become a scourge in the Pacific Coast orchards, but is little known in the Eastern States. The fruit-tree bark-beetle (*Scolytus rugulosus*), a general borer, often attacks the peach. Since it prefers ailing trees the girdling of unprofitable specimens is recommended, these trees serving as decoys for the females to lay their eggs in. The trees are to be cut and burned. The peach-tree aphis (*Myzus persicæ*) and the black peach aphis (*Aphis persicæ niger*) are often troublesome but may be controlled with kerosene emulsion. Several leaf-chewing insects often cause damage; for instance, the peach-tree leaf-roller (*Pytcholoma bersicana*), and the New York weevil (*Ichthycerys novaboracensis*), all of which are more or less perfectly controlled by arsenites, lime being added to prevent injury to the foliage. Several scale insects and bark-lice are often serious enemies. The most troublesome insects, however, are the curculio (see PLUM) and the peach-tree borer (*Ægeria exitiosa*). This latter is the caterpillar of a clear-winged, day-flying, wasp-like moth, which lays its eggs usually near the ground on the trunks from midsummer until autumn. The larvæ bore beneath the bark to the cambium layer, feed on the young wood, pass the winter in the larval form in little shelters made of peach gum, castings, etc., and after eating actively for several weeks in the spring, pupate for about three weeks. The adults emerge in the North during midsummer, in the South in late spring. The trunks of peach-trees should be examined during October and April, and the larvæ grubbed out and destroyed. They are easily discovered by the castings and gum. Most frequently they are within six inches below or above the surface of the ground. See FRUIT-GROWING; FRUIT INDUSTRY.

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PEACH-TREE CREEK (Atlanta), **Battle of.** After the engagement at Smyrna Camp Ground (q.v.), 4 July 1864, General Sherman secured three crossings of the Chattahoochee River above Gen. J. E. Johnston's position, with good roads leading to Atlanta; whereupon Johnston on the night of the 9th crossed to the east side of the river. On the 17th Sherman ordered a general advance on Atlanta, and by night the entire army formed a general line along the old Peach-tree road. On the night of the 17th General Johnston was relieved from command of the army confronting Sherman, and was succeeded by Gen. J. B. Hood. His army numbered about 51,000 men, strongly posted about four miles in front of Atlanta, on the south bank of Peach-tree Creek, holding the line of that stream and the Chattahoochee for some distance below the mouth of the creek. On the 18th and 19th Sherman's army, with General Thomas' Army of the Cumberland on the right as a pivot, swung to the right and, all advancing, closed in on Atlanta. General Schofield's Army of the Ohio occupied Decatur and then moved toward Atlanta. The Army of the Tennessee, under Gen. J. B. McPherson, destroyed several miles of the Augusta Railroad east of Decatur, and then closed in on that place. Thomas, after some sharp skirmishing, put his heads of columns across Peach-tree Creek by several bridges, but there was a gap of two miles between him and Schofield, which he partially closed on the 20th by two divisions of the Fourth Corps, Newton's division of the same corps being left on the Buckhead road, on the left of Hooker's 20th Corps. When Hood, on the 19th, knew that Thomas was crossing Peach-tree Creek, he determined to crush him before he could entrench, and then turn on Schofield and McPherson. General Cheatham's corps was Hood's right, Hardee's his centre and Stewart's his left. Cheatham was to hold his left on the creek to separate Thomas from Schofield and face Schofield and McPherson, while Hardee and Stewart, moving by division in echelon from the right, went against the flank and front of Thomas to drive him back to the creek and then down it toward the Chattahoochee into the narrow space formed by the river and the creek, into a sort of pocket. The order was given to advance at 4 P. M. of the 20th and sweep the field. Bate's division, on Hardee's right, passing by Newton's left, found no enemy in its immediate front, and failed in an effort to reach Newton's flank. Walker's division, in Hardee's centre, struck Newton's division, bent back both flanks and, after a severe struggle, was driven back with great loss. A part of Hooker's corps assisted Newton. Hardee was about to renew the attack on Newton, with Maney's and Cleburne's divisions, when Cleburne was withdrawn to go to the extreme right, and Hardee gave up further attack. On Hardee's left Stewart made a furious attack upon Hooker, whose troops had not fully taken position. Geary's division had crossed the creek more than a half mile above Howell's Mill, and was on high timbered ground, with its right thrown forward, and the 33d New Jersey was thrown to a bare hill some distance in advance. Williams' division was moving up to connect with Geary on the left and Palmer's division of the 14th Corps on the right. Ward's division was near Collier's Mill, on Geary's left and rear, near the banks of the creek to the rear and right of Newton's division, from which position its brigade commanders led their men against the flank of Walker's division, engaging Newton. Stewart, moving by division in echelon, first struck the 33d New Jersey, almost enveloping it, driving it back and taking many prisoners. It then fell upon Geary, Ward and Williams, in quick succession making a series of determined assaults, continuing until night, when he was finally repulsed and withdrew to the works from which he had advanced, with a loss of about 2,000 men. The Union troops engaged numbered about 20,000, the Confederates about 19,000. The Union loss, killed and wounded, was about 1,600, of which nearly 1,500 fell upon Hooker's corps; the Confederate loss, killed and wounded, was about 2,500. Consult 'Official Records' (Vol. XXXVIII); Cox, 'Atlanta'; Van Horne, 'History of the Army of the Cumberland' (Vol. II); Sherman, 'Personal Memoirs' (Vol. II); Johnston, 'Narrative of Military Operations'; The Century Company's 'Battles and Leaders of the Civil War' (Vol. IV).

E. A. CARMAN.

PEACOCK, Thomas Love, English novelist: b. Weymouth, Dorset, 18 Oct. 1785; d. Halliford, 23 Jan. 1866. He was at first in mercantile life in London (1808–09); secretary to Sir H. R. Popham. In 1819 he was appointed to the East India House, and in 1836–50 was chief examiner to the company. He wrote some ambitious but artificial poems, such as 'Rhododaphne, or the Thessalian Spell' (1818); but found his true field in the satirical novel, 'Headlong Hall' (1816); 'Melincourt' (1817); 'Nightmare Abbey' (1818); 'The Misfortunes of Elphin' (1829); 'Crotchet Castle' (1831); 'Paper Money Lyrics and other Poems' (1837); and 'Gryll Grange' (Fraser 1860). These maintain real humor, and the later ones, if they lack for invention, are nevertheless interesting from the frank expression of prejudice with which they abound. His characters are, however, delightful, more types than real living personages. The lyrics interspersed through these volumes are Peacock's best verse. His works were edited by Garnett in 1891. Peacock made the acquaintance of Shelley and his wife in 1812 while on a tour through Wales, and the friendship continued throughout the life of the more famous poet. On his death Shelley made Peacock his executor, together with Byron; and the former was indefatigable in his collection of material of all kinds relative to the life and work of Shelley. Consult Brett-Smith, 'Peacock's Memoirs of Shelley with Shelley's Letters to Peacock' (London 1909); Freeman, A. M., 'Peacock' (New York 1911); Saintsbury, G. E., 'Essays in English Literature 1780–1860' (London 1890); Van Doren, Carl, 'Life of Thomas Love Peacock' (New York 1911); Vincent, L. H., 'Dandies and Men of Letters' (Boston 1913).

PEACOCK. See PEAFOWL.

PEACOCK, The. See HORNET, THE.

PEACOCK-BUTTERFLY, a butterfly (*Junonia cœnia*) of medium size, so called from the «eyes» on its wings, which resemble those on peacocks' feathers. The forewings are of a reddish-brown color, with black, fawn and orange markings. The hind-wings are similar in general color, but less red. This butterfly is known over nearly the whole of the United States, in some localities as the «buckeye.» The caterpillar is gray in color with longitudinal stripes, and orange bars and dots transversely, and it is studded with black branched spines throughout its whole length. It is to be seen on the mullens about the beginning of July.

PEACOCK AND ÉPERVIER, Battle of, in the War of 1812. On 12 March 1814 Master Commandant Lewis Warrington ran the blockade of New York harbor and sailed for southern waters in the new sloop of war *Peacock* (20 short 32's and two long 12's). On the morning of 29 April he sighted the British brig *Épervier* (16 short 32's and two short 18's), Capt. R. W. Wales. At 10.20 the two ships were at close range but the British gunnery was light and reckless whereas the American guns were well aimed and steadily fired, with the result that in 45 minutes the *Épervier* was hulled 45 times, her rigging was badly cut up, eight of her guns were disabled and her deck was a shambles, 23 of her crew of 128 having been killed or wounded. The *Peacock's* hull was not touched and she suffered only slight injury to her rigging, while only two of her crew were slightly wounded. Though chased by two frigates, Warrington saved his prize and brought her into Savannah. From June to October he cruised near the Faroe and Canary Islands, burning or sinking 12 prizes valued at $493,000 and making cartels of two more. Consult Adams, 'United States' (Vol. VIII, pp. 181–84); 'American State Papers, Naval Affairs' (Vol. I, pp. 313–14); Barnes, James, 'Naval Actions of the War of 1812' (pp. 191–96); Cooper, J. F., 'Naval History' (Vol. II, pp. 130–32); James, William, 'Naval Actions' (pp. 39–42); Mahan, A. T., 'War of 1812' (Vol. II, p. 258 et seq.); Roosevelt, 'Naval War of 1812' (pp. 311–16); Spears, J. R., 'History of Our Navy' (Vol. III, pp. 66–79); Wiley and Rines, 'The United States' (Vol. V, pp. 481–82).

PEACOCK-FISH, a European wrasse (*Crenilabrus pavo*) inhabiting the Mediterranean, so named from its gaudy colors.

PEACOCK-FLOWER. See POINCIANA.

PEACOCK-PHEASANT, a small pheasant of the gorgeously ocellated genus *Polyplectron,* species *chinquis,* which inhabits the forests of the foothills of the Himalayas of Indo-China. The males have two or more — up to five — spurs on each leg. The hen lays but two eggs before sitting. The characteristic call of the male is a clear, strong whistle. The peacock «eyes» from which it gets its name cover the long feathers of the wings.

PEAFOWL, birds of the genus *Pavo;* the type of the sub-family *Pavoninæ* of the pheasant family (*Phasianidæ*). The genus comprises two or perhaps three species of the Indo-China region and neighboring islands of southern Asia, one of which has been extensively domesticated as an ornamental bird in Europe and America. The common peafowl (*Pavo cristatus*) is sufficiently familiar to require no description beyond the rectification of a very common error. The splendid plumes which are the chief glory of the peacock are not the tail quills, but the tail coverts. When these are erected and spread the true tail quills are exposed at their base, and are quite plain and ordinary. They, however, furnish a support for the spread of the tail coverts.

The wooded hill-country of India and Ceylon is the native home of the peafowl and here they are common in a wild state. When courting, the male struts like a turkey-cock, and usually secures three or four hens. They commonly live in small flocks. The wild pea-hen lays from six to eight eggs, and produces only a single brood in each year. The nest is of rude construction, and is placed on the ground, or rarely on low branches or in ruined buildings. The period of incubation extends over 25 or 30 days. The young birds of both sexes are feathered alike for the first two years; and in the third year the tail coverts of the male begin to develop. In cold climates, while the birds seem to thrive, they do not breed readily.

In Bengal, Java, Sumatra, etc., shooting the wild peafowl forms a favorite amusement, and large flocks of these birds are occasionally met with by sportsmen. In India peacocks are held sacred to certain castes and various superstitions are connected with them; in Greek mythology it was the favorite bird of Juno. The peacock was domesticated at a very remote period and some uncertainty exists concerning the exact time of its introduction into Europe. From India it was probably brought to Persia and Media. Aristophanes speaks of «Persian Peacocks.» Suidas terms it the «Median Bird.» The fleets of Solomon brought these birds to Judea. Alexander the Great brought them to Europe; and they were first seen in Rome about the end of the republic, and speedily became objects of interest to the sybaritic tastes of the day. Pliny says that the orator Hortensius was the first who made a table delicacy of these birds, this worthy presenting them at a feast given to the College of Augurs. Vitellius and Heliogabalus introduced at their feasts dishes composed of the brains and tongues only of peacocks. In the Middle Ages in Europe peacocks were still deemed meet dishes for the tables of the great, although in modern times the flesh is accounted coarse and tough. In ancient Greece, in the time of Pericles, those birds brought high prices. From India they were also brought to Asia Minor, and thence into the Isle of Samos, where they were bred and consecrated to Juno, who was alleged in mythological legends to have adorned their tails with the eyes of her favorite, Argus. From Europe they were in turn introduced into Africa and America. A fossil form of the peacock was discovered in California in 1908 and has received the name *Pavo Californicus.*

In domestication the food consists of grain of various kinds, but at times may be quite varied. The young in temperate climates usually require some attention in rearing. They also lay more numerous eggs than in the wild state. The cry of these birds is popularly said to be repeated before the fall of rain. The peafowls are said occasionally to live to a great age; but from 20 to 30 years appears to be the average limit of their existence. The dark-blue-shouldered or japanned peacock is generally regarded as a variety of the common species, but, as it breeds true, it has been described as a separate species. The male is the darkest of all peacocks, and the female almost white. From this variety doubtless has been developed the sacred white peacock of India. A somewhat similar form, however, sometimes appears as a sport from the common species. The Javan peafowl is certainly a distinct species (*P. muticus*) found in Burmah and Java. It has a neck of metallic green with golden glints, and a crest of a different form from the common species. The female in this species is almost as gorgeous as the male.

Consult Beebe, C. W., 'Monograph of the Pheasants' (London 1915).

PEAKE, Elmore Elliott, American novelist: b. Decatur, Ohio, 25 March 1871. He has published 'The Darlingtons' (1900); 'The Pride of Tellfair' (1903); 'The House of Hawley' (1904); 'The Little King of Angel's Landing' (1906).

PEALE, pēl, **Charles Willson,** American artist: b. Chestertown, Md., 16 April 1741; d. Philadelphia, Pa., 22 Feb. 1827. He turned from saddlery to portrait painting, received some instruction from J. S. Copley at Boston and in 1770 became a pupil of Benjamin West in London. In addition to portraiture, he studied mezzotinto engraving, modeling in wax and casting and molding in plaster, in all of which he showed facility. In 1774 he opened a studio at Annapolis, Md., and in 1776 at Philadelphia. He was elected to the Pennsylvania legislature in 1779. In 1802 he opened at Philadelphia Peale's Museum, including collections of portraits and objects of natural history. Peale was not only a collector of natural curiosities and a lecturer on natural history, but turned his hand to a half dozen or more means of livelihood. It is said that he himself sawed the ivory on which his miniatures were painted, molded the glass that covered them and made the shagreen cases that enclosed them. His considerable fame in the United States is due less to genius than to two fortunate circumstances. For many years he was the only portrait painter of worth in the colonies and widely in demand, and he associated his art with the name of Washington, who granted him 14 sittings and whom he portrayed in all guises, from colonel of Virginia militia, to bust portraits. Among his other subjects were Robert Morris, Hancock, Gates, Baron de Steuben, Comte de Rochambeau, Franklin, Nathanael Greene, Jefferson, Hamilton, Monroe, Jackson, J. Q. Adams, Calhoun and Clay. Peale had 11 children, all of whom were named after famous artists. Three of these, Rembrandt, Raphaelle and Titian all became artists; and his brother James gained a reputation as a painter of miniature portraits. Consult Dunlap, 'History of the Arts of Design in the United States' (1834); Isham Samuel 'History of American Painting' (New York 1890); Johnston, E. B., 'Original Portraits of Washington' (Boston 1882).

PEALE, Patrick, a pseudonym of Gustav Anton von Seckendorff (q.v.), a German poet and novelist.

PEALE, Rembrandt, American artist and author: b. Bucks County, Pa., 22 Feb. 1778; d. Philadelphia, 3 Oct. 1860. He was second son of C. W. Peale (q.v.). In 1796 he established a studio at Charleston, S. C., where he remained until 1801. He then became one of West's pupils in London and for some time thereafter was occupied at Paris in painting portraits of celebrities for Peale's Museum at Philadelphia, which his father had established sometime previous to this. In 1810 he began painting in Philadephia. Two of his great exhibition pictures, 'The Roman Daughter' and 'The Court of Death,' attracted much attention. The latter was a canvas 24 × 13 feet, and contained 23 figures. The most of his time, however, was devoted to portraiture. He several times painted Washington, the portrait of 1823 being justly famous. The original was purchased by Congress for $2,000 in 1832 and many copies were ordered from the artist. This work, whose authenticity is sufficiently indicated by the fact that Chief Justice Marshall called it «more like Washington himself than any portrait I have ever seen,» is a truly impressive delineation and has remained favorite among the general public. In 1829 he went to Europe and while there visited France and Italy; and finally, in 1833, he took up his residence in London, after having first returned to the United States. But his restless nature did not allow him to remain there and he drifted back to Philadelphia. His paintings include 'Court of Death' (1820, Detroit Art Gallery); 'The Roman Daughter' (Boston Museum); 'Ascent of Elijah'; and portraits of Gilbert Stuart, Thomas Jefferson, Mrs. Madison (New York Historical Society); Washington (Independence Hall, Philadelphia). Among Peale's writings were 'An Account of the Skeleton of the Mammoth' (1802); 'Notes on Italy' (1831); 'Graphics' (1841); 'Reminiscences of Art and Artists' (1845). His technique was more accurate than that of his father; but his work has in general less life than that of the elder Peale. Consult Lester, C. E., 'The Artists of America' (New York 1846).

PÉAN, pa'an', **Jules Emile,** French surgeon: b. Marboné, Eure-et-Loire, 1830; d. 1898. In 1860 he was graduated in medicine at the University of Paris and was made prosecteur. From 1868 to 1892 he was employed as hospital surgeon in several institutions and in the latter year opened a private hospital. He was elected to the Academy of Medicine in 1885. He was the greatest French abdominal surgeon of his day. In 1864 he performed the first successful operation in France for removal of the ovaries. Many surgical and gynæcological instruments were invented or improved by him. He edited Nélaton, 'Elements de pathologie chirurgicale' (1872) and published 'De la scapulalgie et de la résection scapulo-humerale' (1860); 'Ovariotomie et splénotomie' (1869); 'Hystérotomie' (1873); 'Leçons de clinique chirurgicale professée à l'Hôpital Saint-Louis' (9 vols., 1879–95); 'Diagnostic et traitement des tumeurs de l'abdomen et du bassin' (1880–89).

PEANUT, a spreading, hairy, annual herb (*Arachis hypogæa*) of the order *Leguminosæ.* It grows about 18 inches tall, bears light green leaves and whitish flowers, after the fading of which the stems bury themselves in the ground, where the one to three-seeded yellowish pods mature. The plant is considered to be a native of Brazil, whence it was introduced into Europe shortly after the discovery of South America, and whence it has been carried by man to nearly all warm climates throughout the world. Since the Civil War it has been an important agricultural crop in the South, especially from Virginia to Georgia and in Tennessee, where the plant is known locally as «goober-pindar,» «ground-pea,» etc. The crop averages about 20,000,000 bushels annually, three-quarters of which is recleaned for roasting and sale as a luxury, either alone or in confectionery, etc. This use is distinctly American; in the Old World the «nuts» are used mainly for making oil and for stock-feeding. Peanut butter, soups, cakes, etc., are manufactured, but have not become widely popular. From 25 to 50 per cent of oil may be expressed from the shelled nuts, and this, if carefully prepared, is useful for cooking and in the arts. The «hay» is fed to stock, as also is the cakes left after the oil is expressed. Pigs are often profitably turned upon the fields after the harvesting of the crop, and still more profitably upon unharvested fields. The cost of digging is thus saved and the peanuts make a good quality of pork, which, however, is somewhat soft and should be hardened by feeding corn to the animals.

Peanuts thrive best upon very light, sandy loam, well supplied with lime. They are also favored by an early warm spring and a hot, humid summer. The soil should be deeply plowed and finely harrowed, and the unshelled seeds at the rate of about two bushels to the acre, planted about an inch deep, at intervals of a foot in rows about 30 inches apart, as soon as the weather has become settled in the spring. Until the plants shade the ground the surface must be kept loose and open and free from weeds, especially turf-forming grasses and similar weeds. Before danger of frost the plants are harvested with special implements, dried in loose shocks for two or three weeks, the pods removed and sent to «recleaning» establishments, where they are finished for market. Under ordinarily good management 50 bushels of «nuts» and two tons of straw should be obtained from an acre. In Europe the peanut is perhaps best known as ground nut and earth nut. See Peanut Industry, The.

PEANUT INDUSTRY, The. The people of the United States consume upward of $25,000,000 worth of peanuts annually, while during each year the country produces 20,000,000 bushels of peanuts, or 88,000,000 pounds. This is not a very large fraction of the total world's supply, which amounts to about 600,000,000 pounds. The exportation from Africa and India to Europe reaches to about 450,000,000 pounds annually. Of this vast quantity about 50 per cent goes to France, the bulk of it being pressed for oil. The peanut is employed mainly as an adulterant of or as a substitute for olive oil and it is so excellent in quality that most people cannot detect the difference. Nearly all the olive oil that comes to the United States is at least mixed with part of the peanut. Peanuts furnish from 30 to 50 per cent of the weight of their kernels in oil. The latter is somewhat more limpid than olive oil. It serves excellently for lighting, though it does not give so clear an illumination as some other seed oils. Furthermore, it is utilized to advantage in the making of soaps and as a lubricant in machine shops.

During the years between 1861 and 1865 peanut-oil was manufactured by at least four mills in the Southern States, and used as a lubricant by railroads for locomotives, by wood and cotton spinners for their spindles and by housewives instead of lard as shortening in bread and pastry. Though the American peanut is finer, larger and better flavored than any other, it does not contain so much oil as the African nut, and the oil is not of so fine a quality. The oil of the peanut is utilized medicinally to some extent, and fullers of cloth get another employment for it in their business. The «cake» which is left after the oil has been expressed makes an excellent feed for cattle, and is used as such to a great extent, particularly in Germany.

It is said that peanuts were introduced to the United States by the negroes imported from African slavery. Between 1865 and 1870 the cultivation in the United States spread with great rapidity, owing largely to the knowledge of plants gained by individual members of the various armies which at one time or another occupied the eastern section of Virginia. Each year doubled and at times increased threefold its crop over that of the preceding year, so that this country, from being a large importer of West African nuts, was soon able to supply the domestic demand with the home-raised article. Wasteful methods of cultivation and the consequent impoverishment of the land have diminished the yield of the peanut-producing territory in Virginia, North Carolina and Tennessee very seriously.

Norfolk, Va., is regarded as the centre of the peanut trade, and Virginia produces a larger quantity than any other State. The leading peanut counties are Southampton, Nansemond, Isle of Wight, Sussex and Prince George, ranking in the order named, and reporting, in the aggregate, about 75 per cent of the total acreage.

The Southern farmers do not prepare their peanut for market. The crop is delivered to «factories,» where the nuts undergo a process of cleaning and sorting. The peanuts are hoisted to the top of the factory building, where they are poured into hoppers, passing downward through chutes and being separated roughly into four grades by the mere action of gravity. The best ones are necessarily the heaviest, being the largest, having the biggest kernels and being most free from «pops.» The first, second and third grades are sold to venders of roasted peanuts, either directly or through jobbing-houses. The fourth grade goes into the hands of confectioners, to be used in the making of «burnt almonds» of a cheap sort, peanut candy and common chocolates. Peanuts of the lowest grades are shipped mostly to New York City. Consult Bailey, L. H., 'Cyclopedia of American Agriculture' (New York 1907); Beattie, W. R., 'The Peanut' (in Farmers' Bulletin No. 431, Washington 1911); Roper, W. N., 'The Peanut and its Culture' (Petersburg, Va., 1905).

PEAR, a tree (*Pyrus communis*) of the natural order *Rosaceæ*. It is probably a native of western Asia and adjacent Europe, whence it has been introduced by man into all temperate climates of the civilized world. The chief producing countries are France and the United States, and in the latter the principal regions are New England, New York, Michigan and the Pacific Coast States, particularly California. Among the fruits of the United States the pear ranks fourth in commercial importance. It is distinctly a cool climate tree, but except certain inferior Russian varieties does not thrive on the cold Western plains. Some of its hybrids with the Chinese sand pear (*P. sinensis*) do well in the South, but their inferior quality is against them. The Kieffer, Leconte, Garber and Smith varieties are most often planted; the first not only in the South, but very generally throughout the Eastern States. This is a chance hybrid between the original species, which was grown for ornament by Kieffer, a Philadelphia nurseryman, and was introduced as an acquisition. It is famous for poor quality, but is extensively used as a substitute for the Bartlett, especially in canning. The Bartlett, a European variety known as Bonchrétien, is the most widely cultivated pear in the United States, being popular in all the pear-growing regions. The most noted variety in point of quality is the Seckel, an American sort, which though of small size is considered the acme of the thousands of varieties cultivated throughout the world.

The pear is generally propagated by means of root-grafting, the scions for which are imported from France. These form what are called standard trees, which are usually planted 20 to 25 feet asunder in the orchard. Dwarf trees are produced by grafting the pear upon quince stocks, which are also imported from France. They should not be planted closer than 12 feet, and a rod asunder is even better. The usual methods of planting are in rectangles, in "quincunx" form and in hexagons. The first two are popular in the East, the last on the Pacific Coast. The last is generally best because, where distances are adequate, ground can be more economically employed and cultivation may be given in three directions.

The pear will grow upon almost any soil, but thrives best on well-drained heavy loams, except the Chinese hybrids which do best upon lighter soils. Air drainage is as important as water-drainage; therefore, the orchard should be on high ground. The field should be deeply plowed and thoroughly harrowed before the trees are set, and throughout the season the land should be kept loose, open and free from weeds by frequent cultivation. About mid-summer a cover-crop should be planted to conserve the plant-food that might be wasted by leaching during the winter, and also to check the growth of wood and assist in the maturing of that already produced. If leguminous crops are employed for this purpose, they should obviate the necessity of fertilizing heavily, if at all, with nitrogenous fertilizers such as stable manure and nitrate of soda. (See LEGUME; CLOVER, etc.). Applications of phosphoric acid and potash may be given liberally.

After the trees are set the tops should be pretty severely pruned, only two or three buds being left upon from three to five well-placed twigs, preferably near the ground. The ideal form for training the pear resembles that of a vase, because when attacked by pear-blight or fire-blight (see below) the tree can then often be saved, whereas if trained with only one trunk it usually cannot. Each main limb should be made to divide and redivide, thus forming a spreading tree with a somewhat hollow centre. Though the work during the first five years of the orchard's life may seem excessive its value will be appreciated in after years. Dwarf pears should also be trained in this form; but since they must be kept dwarfed (below 12 feet) and since they have a tendency to develop into standards, especially if the scion takes root above the quince stock, they must be severely cut back late each winter. Many growers advocate removing fully two-thirds of the annual growth of the previous season. Care must be taken in pruning all pear-trees to save the gnarly twigs, which are generally of irregular thickness and direction. These are the fruit-bearing spurs. They do not appear upon young trees.

The pear is more noted for self-sterility than most other perfect flowered fruits; the pollen of certain varieties is impotent upon the pistils of the same variety. Failure to set fruit may also result from a variety of causes, such as cold or rainy weather at blossoming time, difference in time of opening of the flowers of adjacent varieties, impotent pollen or pistils due to overfeeding of the orchard, etc. To obviate self-sterility, two or more varieties should be chosen which blossom simultaneously, and these should be planted in adjacent rows, not more than three rows of a kind together — preferably two.

Pears should be gathered when they will readily separate from the twigs without breaking the fruit-stalks. If allowed to hang upon the tree until fully ripe they usually lose flavor and become more gritty. When gathered they are usually hard and imperfectly colored, but if stored in a cool room and still air, preferably in boxes or drawers, they will acquire both good color and flavor, besides obviating grittiness and decay at the core to a great extent. Freely circulating air, especially if warm, tends to shrivel the fruit, make it decay and impair the flavor. Winter pears may be left upon the trees until danger of frost is feared; then they should be carefully gathered and stored in cold well-ventilated cellars, being removed for ripening to warmer quarters as needed.

Several of the diseases which attack the pear have been treated under the title APPLE. The two most dreaded maladies are pear-blight and leaf-spot. The former is attributed to a species of bacterium which may gain entrance to the tissues at any "naked" point such as a wound, tips of growing twigs, or, especially, through the nectaries and pistils of the flowers, to which it is conveyed by insects. The disease manifests itself by the blackening of the foliage which hangs on the tree. As the organism works its way down the limbs toward the trunk, it discolors the young tissues upon which it subsists just beneath the bark. In early spring there may be a somewhat saccharine exudation from affected parts of the trunk and limbs. Insects carry infection from these places. Hence the advisability of examining the trees and removing diseased parts in late winter. Whenever the operation is performed the affected branch should be removed several inches below the point of discoloration. Many orchardists recommend sterilizing the tools after each operation, using a solution of bichloride of mercury. The disease is believed to be more prevalent upon light, rich and low soils upon which the growth is usually sappy. Some varieties, such as Duchesse d'Angoulême and Kieffer, are considered fairly immune.

Pear-leaf blight (*Entomosporium maculatum*) is distinct from the previous disorder, being a fungus origin. It appears upon the twigs as black spots; upon the leaves as more or less coalescent reddish brown spots; upon the fruit as upon the leaf, the underlying tissues being hard and cork-like, badly attacked specimens often becoming lopsided and cracked. The trees are frequently defoliated from the falling of the leaves. Bordeaux mixture is considered a specific; many varieties formerly failures now being grown successfully where sprayed. Applications should be given at intervals of two weeks from the time the buds commence to swell until early summer, or, in wet seasons. later and more frequently.

Among the numerous other insects that feed upon the pear the following are probably best known and most easily controlled: Fall webworm, Cecropia moth, eye-spotted bud-moth, white marked tussock-moth, red humped appletree caterpillar, codlin-moth, all of which may be combated by spraying with arsenites. The San José scale and the oyster-shell bark-louse, like several of the above, attack pear and apple (q.v.) indiscriminately. (See INSECTICIDE). Several borers are often troublesome, for instance, the sinuate pear-borer (*Agrilus sinu-*

atus), a European species which tunnels irregularly in the trunk; and the borers mentioned under APPLE. Digging the insects out is the most satisfactory remedy. The larvæ of the pear-blight beetle (*Xyleborus pyri*) burrow in and cause the twigs to wilt. When discovered the withered twigs should be gathered and burned. The pear-slug (*Eriocompoides limacina*) is the larva of a saw-fly probably introduced from Europe. The slugs, which feed upon the leaves, are covered with a slimy secretion to which powdered lime will adhere; hence its use, and also that of road dust, as a remedy. Arsenites, hellebore, kerosene emulsion etc., are also used effectively. Indeed, forcible spraying with water or a heavy rain is often curative. Unless checked this blight frequently skeletonizes the leaves of even large trees.

Probably the most troublesome pear-pest is the pear-tree psylla (*Psylla pyricola*), a flea-louse which seems to be confined to this tree. It is most abundant from Michigan to Virginia and northward into which region it was probably introduced from Europe about 1832. The orange-colored eggs are laid upon the leaves upon which the red-eyed yellow larvæ feed by sucking the juices. Four or more generations appear before frost, at the approach of which the adults hide for hibernation in crevices of the bark. Among the remedies recommended, scraping the trunks, spraying in winter with crude kerosene and with kerosene emulsion when the buds expand, with a second application just before blossoming, are probably the most favored. The psylla has numerous natural enemies; especially the larvæ of lady-bird beetles and of lace-wing flies. See FRUIT-GROWING; FRUIT INDUSTRY.

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PEAR, Balsam, an annual, climbing herb (*Momordica charantia*) of the family *Cucurbitaceæ*. It is a native of southern Asia and tropical Africa and has become naturalized in the West Indies. The plants attain heights of about 10 feet, climbing by means of tendrils; bear large, dull green, maple-like leaves, yellow flowers, and oblong, yellowish, pointed fruits, for which, as well as for ornamental purposes, the plants are cultivated. They are commonly grown to cover small arbors or close in piazzas and porches. They can be grown wherever the cucumber will succeed and with about the same treatment. Under the name *la-kwa* the plants are grown by gardeners near large cities for sale to Chinese who either eat them in the green state after boiling, or the red pulpy arils surrounding the seeds after the fruit is ripe. The seeds are oddly shaped and fantastically "sculptured," and are often used in home decorative work.

PEARCE, Charles Sprague, American artist: b. Boston, 13 Oct. 1851; d. 1914. He was a pupil of Bonnat at Paris and in 1885 established his residence at Auvers-sur-Oise, near Paris. His first exhibited picture was shown at the Paris Salon in 1876 and from that time on his paintings appeared in most of the international exhibitions of America and Europe. He was one of the first members of the Society of American Artists, an associate of the National Academy, an officer of the Legion of Honor, a member of numerous foreign orders. He was one of the jury of selection for the World's Columbian Exposition in 1893, and was the recipient of many gold and silver medals and of the grand diploma at Berlin (1914). He began his work as an artist by painting historical scenes, but he gradually left this field for that of modern life; his favorite subject being the peasant life of Picardy. In everything except name and place of birth Pearce was European. His education, his associations, his subjects and his manner of treatment are essentially French. He shows skill in composition and in technique; his drawing is always good, and his tones, though not deep, are harmonious. Among his works are 'Decapitation of Saint John Baptist' (1881); 'Prelude' (1883); 'Toilers of the Sea' (1884); 'Return of the Flock'; 'Meditation'; several portraits, and decorations for the north hall of the Congressional Library (1896).

PEARCERITE. A silver ore consisting of sulpharsenite, Ag_3AsS_3 (or arsenical polybasite). Occurs disseminated in pink barite, and in siderite with galena at Aspen, Colo., also as ore at Marysville, Mont., and the Tintic district, Utah.

PEARD, Frances Mary, English novelist: b. Exminster, Devonshire, 1835. She is the author of numerous novels and historical romances which have attained popularity both in Great Britain and United States. Among them are 'Unawares'; 'Schloss and Town'; 'Prentice Hugh'; 'The Horse and Away'; 'One Year'; 'The Rose Garden'; 'A Madrigal'; 'Near Neighbors'; 'The Baroness'; 'Mother Molly'; 'Contradictions'; 'Madame's Granddaughter'; 'Alicia Tennant'; 'The Swing of the Pendulum'; 'Paul's Sister'; 'An Interloper'; 'Jacob and the Raven'; 'The Career of Claudia'; 'Donna Teresa'; 'Number One and Number Two'; 'The Ring from Jaipur'; 'The Flying Months.' Miss Peard has also been a successful writer of stories for children. Of these the best known are 'The Blue Dragon,' 'The Abbot's Bridge' and 'Scapegrace Dick.'

PEARL, the substance forming the inner layers of the shells of nacreous mollusks, as pearl-oysters, abalones and others. In the mass it constitutes "mother-of-pearl"; when in the form of a detached lustrous concretion it is called "a pearl," and regarded as a gem. In order to make clear the nature of a pearl it is necessary to explain briefly the mode of formation of the molluscan shell. The shell ordinarily consists of two distinct portions of different composition. The superficial epidermis, outer layers and margin of the shell are largely horny, while the inner part is composed of numerous layers of a crystalline carbonate of lime with relatively little animal matter. Both are secretions of the outer surface of the "mantle" (see MOLLUSCA), which lines the shell, and by the free outer margin of which the shell grows in concentric additions to its margins. The remainder or attached portion of the mantle is continually secreting calcium carbonate, which is added layer by layer to the inner surface of the shell, which thus increases in thickness. The iridescence is due to the fine irregular striations upon the surface. Now, if any foreign body like a grain of sand, an undeveloped egg, a parasite or an image artificially placed there find lodgment between the mantle and the shell it seems clear that the shelly deposit must envelop it. It is probable also that it will act as an irritant and stimulate secretion at that point, and that it may be rolled about by slight contractions of the mantle, thus remaining free from adhesions to the shell and gaining symmetry. Taking advantage of this known fact, Chinese pearl fishers insert a tiny piece of flinty sand or hard bone between the shell and the body of the oyster. This irritates somewhat as does the lodging of a cinder in the eye of a human being, and the oyster proceeds to cover it with layers of the protective excretion which in time harden and become a beautiful pearl. Such detached portions of the shell, developed as concretions about foreign particles serving as nuclei, are found in many mollusks. Their character naturally partakes of the character of the shell in which they are formed; if that be opaque and dull so also will the pearls; if it have the iridescence and translucency of mother-of-pearl, they will possess these same elements of beauty. It is vain, therefore, to expect to find pearls of value in common edible oysters, as people often do. Comparatively few mollusks have a well-developed nacreous lining to the shells, and only a few of these are adapted to the production of pearls of the texture and lustre which is most prized. They belong chiefly to the *Aviculidæ*, or pearl-oyster family, and to the *Unionidæ*, or family of the fresh-water mussels (q.v.).

The *Aviculidæ* differ from the edible oysters in having a small foot and anterior adductor muscle, a well-developed byssus gland, which secretes a bunch of fibres, by which the animal is attached, and a thick mother-of-pearl layer to the shell. The true pearl oyster (*Meleagrina margaratifera*) has a very wide distribution, being found in nearly all parts of the Indian Ocean, the Red Sea, the warmer parts of the south Pacific, the Gulf of California, Caribbean Sea. There is, however, a very great difference in the color, size, thickness and texture of the shells, and the quality of the pearls produced in the different localities. Pearls have been gathered commercially in many parts of the world, but most of the fisheries have had periods of prosperity and decline, the latter usually resulting from wasteful overfishing. The oldest fisheries are those of Ceylon on banks covering an extensive area off the north coast. These have been fished at intervals from the beginning of the Christian era, and since the British occupation have been under the control of the government, which derives rich revenue therefrom.

In America the most important fishing ground is in the Gulf of California, centring about La Paz, but extending to the mouth of the Colorado River. These fisheries were operated by the Indians at the time of the conquest by Cortez, who exploited them for the benefit of the Spanish throne. The fishing season lasts for about six months, from June to December. Formerly expert Indian and Mexican divers were employed. Several of these went together in one canoe, acting alternately as diver and helper. The water is so clear that oysters could be seen on the bottom in 50 or 60 feet. The diver, carried down by a large stone, would remain for about a minute and a half, and bring the oysters to the surface in his hands after cutting them loose with a knife carried for that purpose. In order to have the greatest possible lung expanse the divers always worked with empty stomachs, eating nothing until after the conclusion of the day's fishing. If abundant a basket would be lowered and filled. Working in this manner each diver would secure from 125 to 150 oysters daily and the total product for the season of 450 divers would be about 2,000 tons of oysters, yielding pearls and shell valued at about $400,000. At the present time the chief concessions are controlled by San Francisco firms, and the fishing is conducted by more modern methods. Each diving-crew secures about 300 oysters per day, which are collected by a schooner and carried ashore, where they are opened with knives and the pearls removed. Other American fisheries exist on the coasts of Guatemala and Panama and the island of Margarita. The Red Sea, many of the South Sea islands and the north coast of Australia also supports valuable fisheries. The latter is one of the most recently developed and has grown rapidly in importance. It is conducted by means of diving suits and is very productive, especially of mother-of-pearl, for the shells become here larger and thicker than elsewhere in the world.

Fresh-water mussels (*Unionidæ*) are found in many streams and lakes of Asia, Europe and America. In the United States these mollusks are exceedingly numerous in the Mississippi Valley, both in species and individuals, and are chiefly utilized in the States of Iowa, Wisconsin, Arkansas, Tennessee and Kentucky, but spasmodic periods of excited pearl-hunting in other States have occurred several times and have been productive. The mussels are secured by rakes, tongs, drags or simply by the hands; even a steam dredge is operated in connection with the Iowa button-factories. The value of the mussel fisheries of the United States is about $3,000,000 yearly, one-third of which is from shells. In Europe the supply is conserved by carefully opening the mussels for examination by means of specially devised tools which do them no injury, and then replacing them in the water. Fresh-water pearls are especially valued because of the great variety and beauty of their colors and are, like the marine pearls, most likely to be found in shells which are distorted or otherwise imperfect in form and growth. The pearl button industry of the United States has reached about $9,000,000 yearly. The leading States of this industry are Tennessee, Kentucky and Wisconsin.

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PEARL, The, a Middle-English narrative vision-poem, with marked lyrical elements. 'Sir Gawain and the Green Knight,' 'Patience' and 'Purity' are, with this piece, generally assigned to a single author, since all are in the West Midland dialect, are preserved in the same manuscript and exhibit common stylistic and metrical characteristics. The name of this author is, however, not known, and the evidence for the ascription of the four poems to the same man is not wholly conclusive. 'The Pearl' may be conjecturally dated about 1370. It consists of 101 stanzas of complicated structure, with both alliteration and rhyme, arranged in 20 groups, consisting, with the exception of one group, of five stanzas each. The whole exhibits the most finished artistry, and may be justly regarded as one of the most important of all the earlier poems in the English language. Its sensitiveness to nature, its moral elevation and its deep religious feeling are particularly noteworthy. After the conventional dream-setting, the poet, who has lost his "pearl of great price," beholds a beautiful maiden, in a land of surpassing loveliness, who reveals to him the joys of Heaven, and consoles him in his trouble. Finally he sees in a vision the Heavenly Paradise, with thousands of virgins adorned with pearls, the mystic brides of Christ. The whole has generally been held to be the poet's expression of personal grief at the loss of his little daughter, but this view has in recent years been challenged, and the whole interpreted as an allegorical presentation of purity, symbolized by the pearl, and personified by the maiden. The poet was obviously familiar with theological material, and was generally orthodox in regard to religious questions of his day.

The piece has often been translated into English. Miss Weston's version in the original metre (in 'Romance, Vision and Satire,' Boston 1912) gives an excellent idea of the poem, as does also 'The Pearl: A Middle English Poem,' a modern version in the metre of the original, by Sophie Jewett (New York 1908). A convenient edition is that by Osgood, Boston 1906, with introduction, glossary and bibliographical references. The articles by W. H. Schofield and Carleton Brown deserve especial attention.

William Witherle Lawrence.

PEARL OF THE ANTILLES, a name given to the island of Cuba on account of its fertility and beauty. See Cuba.

PEARL ASH, crude potassium carbonate as obtained by the lixiviation of wood ashes, and the subsequent evaporation of the solution. It is a finer grade of pot-ashes. In early days practically the whole supply of potash came from wood ashes, and great forest areas were destroyed to get this invaluable chemical. With the spread of population the forests have become too valuable for such uses except in the most remote regions, where no other use of the forests is possible. In some parts of Canada, and in a very few sections of the United States pearl ashes are still produced, and there is also a supply from Russia and Austria.

There is a large difference in the polasti content of various woods. Wormwood is credited with the largest percentage — 7.30; vetches have 2.76 per cent; nettles, 2.50 per cent; ferns, 0.63 per cent; grapevines, 0.55 per cent; rushes, 0.51 per cent; beech twigs and branches, 0.48 per cent; oak barrel, 0.42 per cent; pine, 0.045 per cent. In the prevailing process the wood is burned in pits, ferns and vine stalks being added. The resulting ashes are dampened with water and placed in a cask with a perforated false bottom over which a layer of straw has been laid. Hot water is poured in, and the whole allowed to stand for some hours. The liquor is then drawn off from the bottom reservoir by a faucet. If this is strong enough (32° Tw) it is boiled down at once; otherwise it is poured into the next cask to be leached. The residuum from the leaching has considerable value for manure. The boiling down is done in cast-iron pots, and the dried out potash is heated to redness. The crude product is dissolved in water to remove the insoluble substances, the liquor evaporated and the dry product again calcined, when it is graded as "American pearl ashes." The commercial pearl ash contains from 65 to 77 per cent of potassium carbonate, 2 to 4 per cent of sodium carbonate, 11 to 21 per cent of potassium sulphate and 3 to 7 per cent of potassium chloride. See Potassium.

PEARL BARLEY, a preparation of barley-grain. See Barley.

PEARL HARBOR, an inlet on the southern coast of the island of Oahu Hawaii, six miles west of Honolulu. It is landlocked and has a depth of from 50 to 60 feet, but there was a bar at the entrance with only 10 feet of water, thus making the harbor useless for large vessels. In 1884 the United States obtained from the Hawaiian king the exclusive right to establish a coaling and repair station at this harbor. Surveys were made in 1887 and 1897, and the removal of the obstructing bar to the entrance proposed; but nothing was done in the way of improvement of the harbor facilities until the annexation of the Hawaiian Islands by the United States in 1898. With the ownership of the islands an assured fact, the United States government proceeded to make of Pearl Harbor a first-class naval base. A channel four and one-half miles in length was dredged from the sea across the bar and coral reef, to the yard site, with a depth throughout of 35 feet, with a width through the bar of 600 feet, and from that on, of 500 feet. This makes the harbor available for the largest vessels now afloat. The east and west locks provide ample pier accommodations for the discharging and of loading naval stores and supplies; for Pearl Harbor is not intended to enter into commercial competition with Honolulu. The dredging of Pearl Harbor bar was completed toward the close of 1911; and an official entry into the locks was made by Rear-Admiral Thomas in the flag-ship *California* on 14 Dec. 1911, thus indicating the completion of the work of opening the harbor through to the ocean. Provision was at once made to extend the government drydock to 1,000 feet. The caisson for the drydock was built in San Francisco, Cal., and towed to its destination in May of the following year. The width and depth of the drydock on the sills, at mean high water, is sufficient to permit the entrance of the largest battle ships. The dock as thus planned and executed is the largest in America. Buildings, shops, storehouses, offices, barracks and residences completed, or in the process of completion, promise to make Pearl Harbor one of the greatest drydocks and naval stations in the world, and a strong basis for the United States Pacific fleet.

Bibliography.—Goodrich, Joseph King, 'The Coming Hawaii' (Chicago 1914); Thrum, Thomas G., 'Hawaiian Almanac and Annual' ('Retrospect for 1911,' in 1912 Annual; 'Retrospect for 1912,' in 1913 Annual; 'Retrospect for 1913,' in 1914 Annual, Honolulu 1912–13–14).

PEARL MILLET, sometimes called Egyptian Millet or Cat-tail Millet (*Pennisetum spicatum*), not a true millet. It is a native of tropical Africa, and as grown in the United States is a tall (6 to 12 feet) coarse annual forage plant, with seed-spikes about one foot long and an inch in diameter, and affording a very large yield per acre, well adapted for soiling. It can be cut two or three times in the season. For this purpose it is sown at the rate of four pounds to the acre. If wanted for hay from 8 to 10 pounds must be sown, and it must be cut just before heading or it will be woody. See Grasses of United States.

PEARL OF ORR'S ISLAND, The, a novel by Harriet Beecher Stowe, published in 1862. This story gives a truthful and entertaining picture of the people in a Maine fishing hamlet. The descriptions of the picturesque scenery of the island are graphic and accurate; and the Pennel house, now known as the "Pearl House," and the "grotto," are still objects of interest to visitors.

PEARL OYSTER, a name popularly given to the *Meleagris margaritifera*, mollusks of the family *Aviculidæ*, which are not true oysters. See Oyster; Pearl.

PEARL RIVER, a river of the State of Mississippi, formed by the junction of several streams. It rises in Winston County, flows southwest and then south, and empties into the Gulf of Mexico. Length about 300 miles and it drains an area of 7,000 square miles. In the latter part of its course it forms the boundary between Louisiana and Mississippi. The navigation is obstructed by sand-bars and snags, but it is navigable for flatboats for about 100 miles; while vessels of eight feet draft go up to Gainsville. See Boundaries of the United States.

PEARL WEDDING. See Wedding Anniversaries.

PEARLY NAUTILUS. See Nautilus.

PEARSE, pers, **Mark Guy,** English Wesleyan clergyman and author: b. Camborne, Cornwall, England, 1842. He was educated at Wesley College in Sheffield, studied medicine at Saint Bartholomew's Hospital, London, and in 1863 entered the Wesleyan ministry. He held pastorates in Leeds, Ipswich, Bristol and other places, and in 1889 became missioner at Saint James Hall in connection with the West London mission, which position he filled for 14 years. He has devoted much time to literature of a religious character and has published 'Daniel Quorm and His Religious Notions' (2 series); 'The Christianity of Jesus Christ — Is it Ours?'; 'The Gentleness of Jesus'; 'West Country Songs'; 'Sermons for Children;' 'Mr. Horn and his Friends;' 'Short Stories;' 'Good Will'; 'Simon Jaspar'; 'Cornish Stories'; 'Homely Talks'; 'John Tregenowith'; 'His Mark'; 'The Old Miller and his Mill'; 'Rob Rat'; 'Thoughts on Holiness'; 'Some Aspects of the Blessed Life'; 'Praise'; 'Jesus Christ and the People'; 'Short Talks for the Times'; 'In the Banqueting House'; 'Gold and Incense'; 'The God of Our Pleasures'; 'The Story of a Roman Soldier.'

PEARSON, Charles Henry, English historian: b. Islington, 7 Sept. 1830; d. London, 29 May 1894. He was educated at King's College, London, and Exeter College, Oxford; was elected Fellow of Oriel in 1855; was made lecturer in English literature at King's and shortly thereafter professor of modern history. In 1862–63 he edited the *National Review;* in 1865 he withdrew from his chair at King's, and in 1869–71 was lecturer on modern history at Trinity College, Cambridge. After an experience (1871–74) as a sheep-farmer in South Australia, he was appointed by the minister of education of Victoria to prepare a report on the condition of education in Victoria (1877), and he presented a document of value, recommending many changes since introduced. He became professor of modern history at the University of Melbourne and later head of the Presbyterian Ladies' College. In 1878 to 1892 he was a member of the legislative assembly of Victoria and from 1886 to 1890 minister of education, in which capacity he worked effectively toward reorganization and reform; and in 1893 was made permanent secretary to the agent general. He returned to London in 1892. His chief publication is 'National Life and Character' (1893), a work prophesying the decay of European civilization through the disappearance of independent character and genius, due to the increase of democracy in the highly civilized nations of the West; and the growing importance of Chinese and negroes in world politics and trade. Others of his works are 'Russia' (1859); 'The History of England during Early and Middle Ages' (1867); 'Historic Maps of England during the First Thirteen Centuries' (1870); 'English History in the 14th Century' (1876); 'Public Education in Victoria' (1878); 'Reviews and Critical Essays' (1896). Consult Stebbing, William, 'Charles H. Pearson; Memorial by himself, his Wife and his Friends' (London 1900); 'National Life and Character' (1913–14) in which he attempts to show that the white race is doomed to be dominated by the yellow and black races.

PEARSON, Cyril Arthur, English publisher: b. Wookey, near Wells, England, 24 Feb. 1866. He was educated at Winchester College and joined the staff of Sir George Newnes and became manager of the latter's publications. He founded *Pearson's Weekly*, which met with success and subsequently started *Home Notes*, *Pearson's Magazizne, Short-Stories, Royal Magazine, Lady's Magazine, M. A. P.*, and in 1900 his most important publication, the *Daily Express*, a half-penny London paper. In 1905 he secured control of the *Standard* and then of the *Saint James Gazette*. He has since established newspapers in various cities in Great Britain. He became president of the National Institute for the Blind, of the Fresh Air Fund; vice-president of the Tariff Reform League, vice-chairman of the Tariff Commission (1903), and was at the head of many charitable movements. He was knighted in 1916.

PEARSON, John, English bishop and theologian: b. Snoring, Norfolk, 28 Feb. 1613; d. Chester, 16 July 1686. He was educated at Eton and Cambridge and took holy orders in 1639, and the following year he became chaplain to Sir John Finch, Lord Keeper of the Great Seal, and on the outbreak of the Civil War, chaplain to Lord Goring and later to Sir Robert Coke (in London). His first pastoral charge was Thorington in Suffolk. On the Restoration he was made prebendary of Ely, archdeacon of Surrey and master of Jesus College, Cambridge. In 1661 he was appointed Margaret professor of divinity, the following year master of Trinity College and bishop of Chester in 1673. He was a man of prodigious learning, and his 'Exposition of the Creed' is still the best manual of textual and patristic theology in the English language. This was republished in two volumes (1890–91). He also a wrote a vindication of the authenticity of the Ignatian Epistles, 'Vindiciæ Epistolarum S. Ignatii' in answer to Daillé, who had contended that they were spurious. This was followed by 'Annales Cyprianici.' Two years after his death his 'Opera Posthuma Chronologica' were published in London. Consult, Churton 'Minor Theological Works' of Pearson (preface, Oxford, 1844); Cheltham, S., 'John Pearson' (in 'Masters in English Theology,' by A. Barry, London, 1877).

PEARSON, John Loughborough, English architect: b. Brussels, Belgium, 15 July 1817; d. London, 11 Dec. 1897. Trained in his profession by Ignatius Bonomi of Durham and by Salvin and Hardwick in London, he early displayed much skill in mediæval design; was employed in several important restorations; and in Saint Peter's, Vauxhall, produced his first (1861) distinctive work. He continued to devote himself to the development of Gothic, giving his attention to no special phase, though he favored early pointed. His name is largely associated with certain London churches, among others, Holy Trinity, Bessborough Gardens; Saint John, Red Lion square, and Saint Augustine's, Kilburn. But he is perhaps equally well known for his cathedral restorations. He became architect to Lincoln Cathedral in 1870, to Bristol Cathedral in 1880. He was also architect to Rochester, Chichester and Wakefield cathedrals; was consulting architect to those of Exeter and Gloucester; and restored the upper part of the north transept front and the south aisles of choir and nave in Westminster Abbey. In 1879 he received a gold medal and the cross of the Legion of Honor at Paris. In 1879 he received "the greatest ecclesiastical opportunity which has been offered to any modern architect" in his appointment as architect for the new cathedral of Truro, which has been described as the only Gothic work of modern times worthy of the name cathedral. The building was consecrated 3 Nov. 1887, and the completed part opened for service. Pearson's labors were not wholly ecclesiastical, as he also designed county-seats, mansions and other structures. But these works, though excellent in their kinds, added little to his reputation. He was the real founder of the school of modern Gothic, which aims not to copy mediæval precedent but to design anew in the mediæval spirit.

PEARSON, Karl, English educator and sociologist: b. England, 1857. He was educated at King's College, Cambridge, and in Germany, admitted to the bar in 1882, and in that year was appointed professor of geometry at University College, London. In 1885 he was promoted to the chair of applied mathematics and mechanics and in 1911 to that of Galton professor of eugenics and director of the laboratory for national eugenics at the University of London. He is recognized as an authority on eugenics. He received the Darwin medal from the Royal Society (1898). He has published 'The New Werther' (1880); 'The Ethic of Free-thought' (1888); 'The Chances of Death, and Other Studies in Evolution' (1897); 'Enlarged Grammar of Science' (1899); 'History of the Theory of Elasticity and Strength of Materials' with Todhunter (1886–93); 'National Life from the Standpoint of Science' (1901); 'The Life Letters and Labors of Francis Galton' (1914).

PEARSONS, pēr'sônz, **Daniel Kimball**, American capitalist and philanthropist: b. Bradford, Vt., 14 April 1820; d. 1912. He was graduated from the Medical College at Woodstock, Vt., and practised medicine in Chicopee, Mass., until 1857. He subsequently entered the real estate business in Chicago in which he continued with great success until 1887 when he retired, but retained the office of director in the Chicago City Railway Company. He has devoted much attention to philanthropic work, and his benefactions from 1890–1900 amounted to more than $2,500,000, much of which was given to more than 45 colleges, the Chicago Theological Seminary and Beloit College in particular receiving a large share of the benefactions, which ultimately exceeded $4,000,000.

PEARY, pē'rĭ, **Robert Edwin**, American naval officer and Arctic explorer: b. Cresson, Pa., 6 May 1856. He was graduated from Bowdoin College, and in 1881 entered the United States navy as a civil engineer with the rank of lieutenant. From 1884–85 he was assistant engineer in connection with the surveys for the Nicaragua Canal, and later engineer in charge of these surveys. In 1886 he made his first trip to the North, reconnoitring the Greenland ice cap, east of Disco Bay. In 1891–92 as chief of the Arctic expedition of the Academy of Natural Sciences of Philadelphia, he made further explorations, traversing Greenland from McCormick Bay to Independence Bay, in the northeast angle, a trip of 1,300 miles, considered one of the most remarkable polar sledge journeys ever made. He discovered and named Melville Land and Heilprin Land, proved the convergence of the east and west coast of Greenland and determined its insularity. In 1893–95 he again visited Greenland, made a thorough study of the tribes known as the Arctic Highlanders and discovered the so-called Iron Mountain, a group of three large meteorites. In the summers of 1896 and 1897 he made short voyages and in the latter year brought to the United States the meteorites of Cape York. In 1898–1902, he made his most important expedition in search of the North Pole, under the direction of the Peary Arctic Club of New York City. In August 1898 his ship, the *Windward*, had reached the northern side of Princess Marie Bay, where her progress was stopped by the ice. In December he left the ship, and by sledge reached Fort Conger. He returned to the fort again in April 1899, explored the region of Lady Franklin Bay, and rescued the instruments and records left by Greeley at the fort in 1883. From June to July he explored the Princess Marie Bay region, crossed the Ellsmere ice cap and established a line of caches from Cape Sabine to Fort Conger. In 1900 he again visited Fort Conger, and from there, sledging over the ice, along the northwest coast, reached Cape Washington, lat. 83° 39', but finding further progress barred by an impassable sheet of water turned and explored the east coast to within a degree of Independence Bay. In March 1902 he made another start from Payer Harbor, and traveling over the frozen Polar Sea reached Crozier Island, but after that finding every day's march more difficult, and encountering open leads and floes, he had to abandon his hope of reaching the Pole. He had gone as far as lat. 84° 17'. In August he sailed on his return voyage in the new *Windward*, which had been sent north by the club for him. Careful surveys were made at all stages, and much useful information gained; he determined conclusively the northern limit of Greenland, proved that non-existence of land for a considerable distance to the northward and northeastward and determined the origin of the floe bergs and palæocrystic ice. In 1906 he reached 87° 6' in the *Roosevelt*, within about 203 miles of the Pole. On 6 July 1908 he embarked on the steamer *Roosevelt* for what proved his successful attempt to reach the long-sought-for goal. On 6 Sept. 1909 word was received from Peary that he had reached the Pole on 6 April 1909.

In recognition of his achievement, learned societies throughout the world honored Commander Peary in various ways. Besides the LL.D degree from the University of Edinburgh and a silver ship from the Royal Scottish Geographical Society of Edinburgh, he was awarded the gold medals of the National Geographic Society (Washington), the Royal Geographical Society of London and of numerous foreign geographical societies. On 3 March 1911, by special act, he received the thanks of Congress and promotion to rear-admiral. (See POLAR RESEARCH). He published 'Northward, Over the Great Ice' (1898); 'Nearest the Pole' (1907); 'The North Pole' (1910); 'Secrets of Polar Travel' (1917).

PEARYLAND, northeastern coast of Greenland, between Independence Bay and the 80th degree of latitude, which was discovered by Lockwood and Brainard in 1882 and named Hazen Coast. This was extensively explored by Peary 10 years later.

PEASANTS' WAR, or **THE GREAT PEASANTS' WAR,** a name given to the general rising of the German peasantry in 1524–25 and originally correlated with the «Nobles' War,» a term applied to the attempt of the nobles to break free from the power of the princes. The Peasants' War was not an isolated incident, as is clearly shown by the second name given it above. It was an almost inevitable result of the increasing exactions laid upon the peasantry by their masters in a declining feudal system; and it was not the first rising of its sort, for in 1502 and 1514 there had been great revolts called respectively the «bundschuhe» and the «League of Poor Conrad,» and in 1515 an uprising in Carinthia and Styria had maintained itself for several months only to be put down by the emperor after great slaughter. Hence it is evident that the true cause of the Peasants' War was something antecedent in time and deeper-seated than the effects of the doctrines of Reformation, though the latter were prominent among the immediate causes. Luther, who, had he sided with the peasants, would have carried with him the great middle class and so assured the success of the cause, attempted compromise, urged upon the princes the justice of certain demands, suggested to the peasants the withdrawal of others, and after a short interval threw the weight of his influence against the insurgents by the publication of his pamphlet 'Against the Robbing Murdering Troops of the Peasants.' The revolt by this time had spread from the southern Black Forest through Austria, the Tyrol, Alsace and the lower Rhine. Its different bands in different places and with Metzler, Geier, Hippeler and Rohrbach as leaders, had met with little success save in a few cities where they had worked from the inside, notably Heilbronn, Wimpfen, Dinkelsbühl, Mainz and Trier. A trained soldier, Goetz von Berlichingen, had, however, been impressed as general, and while he was moving on Frauenberg the nobles had joined forces, practically at Luther's suggestion. Philip of Hesse, the Elector John and Dukes Henry and George of Saxony met the fanatic Münzer, one of the foremost of the preachers of the revolt, at Frankenhausen, killed 5,000 of his men and took him prisoner, 15 May 1525, and executed him soon afterward. In southern Germany repression was equally swift and terrible; the work was done in Alsace by Anton of Lorraine, and in Swabia by George Truchsess who destroyed Weinsberg, and then joined forces (10,000 men) with the electors of the Palatine and of Trier, marched to Frauenberg, and, when the peasants had been deserted by Goetz von Berlichingen, defeated and practically annihilated the army of 2,000 men under Metzler at Königshofen. The atrocities committed by the victors were in the way of a sanguinary warning. Sixty burghers were executed at Würzburg and at Kitzingen 57 were blinded. Schweinfurt, Bamberg and other cities were heavily mulcted in money. The peasants of the mid-Rhine district had been defeated in the meantime by the forces of the Palatine. The general result added greatly to the burden of the peasants. Consult Bax, E. B., 'The Peasants' War in Germany, 1525–26' (in 'The Social Side of Reformation,' part II, London 1899); Cornelius, C. A., 'Studien zur Geschichte des Bauernkriegs' (Munich 1862); Kautsky, K., 'Communism in Central Europe in the Time of the Reformation' (London 1897); Schapiro, J. S., 'Social Reform and the Reformation' (New York 1909).

PEAT, the partially decayed and compacted remains of mosses and other marsh plants which have become covered with water during the process. Generally the plants grow luxuriantly at the surface but die below and are submerged. The rate of growth is estimated to vary from one to four inches a year and the depth of beds has been found often to exceed 20 feet, but 10 feet or less is more common. The deposits are confined to temperate regions, in both Northern and Southern hemispheres, but especially in the north, where the plants most frequently found in such places are species of sphagnum moss. Peat bogs do not occur or occur but rarely in the warm tropics because the decay of vegetable matter is too rapid to permit of their formation. In the cool north temperate zone the areas covered by peat bogs are enormous. In Ireland estimates place the area of upland bogs at about a million and a quarter acres; that of lowland bogs at more than a million and a half. There are thousands of acres in Germany, Sweden, Norway, England, Scotland, Holland, France and Denmark; and in Russia the area is estimated at 6,700 square miles. In Canada and the United States there are also enormous deposits.

The chief use of peat is for fuel, for which purpose it is most largely employed in Ireland where under the name of turf it is the principal fuel. At a short distance below the surface the peat is brown and somewhat loose in texture; at greater depths it becomes more dense and nearly black; and in many cases it becomes lignite. Owing to the presence of tannin, organic acids, various salts and iron in various forms, which make the substance antiseptic, the plants are so well preserved as to be readily identified and in some cases their perfect condition has led to experiments in their use for the manufacture of textiles from the fibre. Trees, fruit leaves and animal bodies are not infrequently found in as good condition as they might be expected to be after long immersion in a tanning vat. This characteristic is, however, a decided disadvantage when the land is to be used for agricultural purposes, since the reclamation is slow even under the best of management; and as a fertilizer the pulverized peat must be allowed to weather for a considerable time before it can be profitably spread upon other land as a manure. As a manure it is often best applied after being used as an absorbent in stables, where its deodorizing qualities specially recommend it. It also readily gathers and holds the easily-lost nitrogenous salts voided by animals.

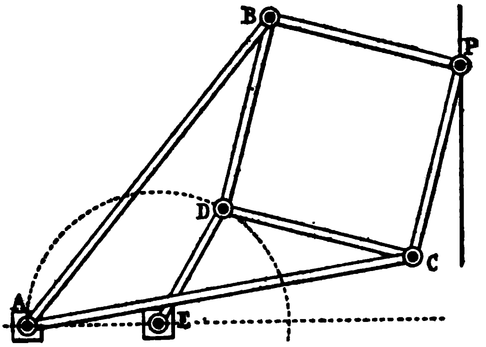
In the conversion of a peat bog into arable land drainage is the first requisite. Then application of lime, marl and other soil amendments must be combined with frequent turning of the surface to the weather, especially to the action of frost during winter. During the first years under crop the yields will probably be light if there is any yield at all. Hence it is often advisable to plant only coarse-feeding crops, such as corn and potatoes, which will require the frequent stirring of the soil. Mineral fertilizers must be given liberally because peat is usually very deficient in such ingredients. And since stable manure seems to accelerate fermentation of the peat it should be applied liberally. Owing to their generally low situation and the consequent settling of cold air upon such areas, reclaimed peat bogs are often unsuitable for many crops which are likely to be injured by cold. They are, however, often admirable for such crops as celery and onions, their fine texture and easy preparation, after once being reclaimed, being decidedly in their favor. They are not, however, enormously rich in plant-food, etc., popular belief to the contrary notwithstanding. American peat contains only about 0.13 per cent of potash, 0.21 phosphoric acid and 0.67 of nitrogen, the last usually in a slowly available form.

In the digging of peat for fuel the bog is partly drained by open ditches, and when the excess of water has disappeared the loose surface is removed and then rectangular «turfs» are cut with specially constructed spades, the blades of which are made in the form of a right angle. The turfs or «peats» are placed on end in little groups until dry, when they are stored under cover. In Ireland, where the operations are performed during spring and summer, men, women and children are employed. And in many cases where the turf is imperfect these people tread the fibrous mud until the peat can be pressed into shape by hand. Owing to its bulkiness, peat cannot be shipped profitably to great distances. The charcoal made from compressed peat is superior to wood charcoal and even compares with coke. That obtained from uncompressed peat is used in tempering cutlery, etc., and as a deodorizer and antiseptic. (See also BOGS; LIGNITE; COAL, etc.; MINERAL PRODUCTION OF THE UNITED STATES). Consult Koller, 'Die Torf-Industrie' (Leipzig 1898); Ries, 'Peat' (Mineral Resources, in United States Geological Survey Report for 1901, Washington 1902); Johnson, 'Peat and Muck' (Hartford 1859); Storer, 'Agriculture' (New York 1897).

PEAT-BOG. See BOG.

PEATE, pēt, **John,** American Methodist clergyman and astronomer: b. Ireland, 6 May 1820; d. Greenville, Pa., 25 March 1903. He came to the United States when very young, engaged in manual labor, but contrived to gain an education and was ordained in the ministry, holding various pastorates for a period covering 50 years. As an astronomer he won a national reputation, making a specialty of the manufacture of reflecting telescope lenses. He made over 20 lenses, each of which exceeded 20 inches in diameter; the largest one he presented to the American University at Washington, D. C.

PEAUCELLIER (pō-sĕl-ē-ā) **CELL,** in mechanics, a form of linkage which possesses great theoretical and historical interest, because it was the first known apparatus by which an independent accurately straight line could be drawn without the use of a straight-edge,— that is, without resorting to the illogical expedient of paralleling some other straight line. It was discovered in 1864 by C. N. Peaucellier, an officer of engineers in the French army, who was tardily rewarded for it by the «Prix Montyon» of the Institute of France. It consists of seven «links,» or bars of metal, which are connected as shown in the illustration. Four of these are of equal length, and are joined together so as to form a rhombus, P C D B. Two other bars, equal to each other in length, but not bearing any necessary metrical relation to the first four, are pivoted to each other at A, and to the original rhombus at B and C. The point A is fixed in position, and the point D is connected with a fixed centre E by means of a seventh bar, DE, whose length is one-half the distance of D from A when the three points A, D and P are in the same straight line. The circle (shown dotted) upon which D is constrained to move would pass through A if it were sufficiently produced. When the various conditions here given are fulfilled, and the «cell» is moved in any way, the point P describes a straight line which is perpendicular to the straight line joining A and E. For a simple proof of this fact, and for an account of other remarkable linkages discovered subsequent to Peaucellier's, consult Kempe, A. B., 'How to Draw a Straight Line' (London 1877).



PEBRINE, a disease of silkworms. See SILKWORMS.

PECAN, pē-kăn′ (*Carya olivæformis*), an American nut tree found native in a restricted district in the southern part of the United States and in Mexico. In the United States its original habitat ranged from central Kentucky and southwestern Iowa southward nearly to the Gulf, following generally the river bottom lands. Of late years the commercial demand for this nut has led to its cultivation in plantations of considerable extent, and the area in which it is now successfully grown includes the southeastern part of Virginia; the easterly third of North Carolina; all of South Carolina, Georgia, Alabama and Mississippi except their extreme northern parts; the southern part of Louisiana; the southeastern part of Texas, and the northern half of Florida. There are also occasional small plantings in the Pacific Coast States, and in central and northern California the pecan is proving more profitable than any other nuts. Generally speaking, the pecan does not fruit reliably north of the 39th parallel.

The earlier plantings of pecans in the United States were of seedlings grown from nuts of the wild trees, but the pecan is now successfully budded and grafted, and the later plantations are of nursery grown trees of choice varieties. In the nurseries the seedling trees are grafted or budded when two years old, and are sold two years later. At this age they range from four to seven feet in height, and it is customary to set them from 40 to 60 feet apart, giving clean orchard cultivation between the trees. The soil best adapted to a prolific yield of nuts is a light sandy loam with clayey subsoil. On richer ground the trees make a more luxuriant growth, but the yield of nuts is smaller.

There are upward of 100 varieties of pecans now listed in the catalogues of the nurserymen, and each particular region of the pecan «zone» has a dozen or more varieties especially adapted to its soil and climate. The favorite variety (where it can be grown) is the «Schley.» This is one of the best in form and quality of kernel, is a regular, though not always a large bearer, and its nuts command the top price in the market. The «Stuart» has been more extensively planted than any other. Its nuts are medium to large, and of excellent quality, but the kernels are apt to crumble badly in the cracking machine. «Van Deman» has been very largely planted, but has developed a tendency to scab, which has been disastrous to some plantations. It bears one of the largest of pecan nuts, of good flavor, thin-shelled and a good cracker in the machines; and is an excellent seller in the market. Many other varieties are as good as these which are mentioned. Few varieties, however, succeed along the northern boundaries of the pecan country, and these bear a smaller size of nut, though often are more prolific. For this section, «Major,» «Niblack,» «Indiana» and «Posey» are in favor.

The pecan trees begin to bear a few nuts about the third year after planting, but this early fruiting is not recommended, and cropping is postponed until the 10th or 12th year, from which time onward commercially valuable crops may be expected.

The yield ranges from 100 pounds up to 1,000 pounds per tree, depending largely upon its size and age. The larger part of the nuts reaching the market are from wild trees and bring up to 25 cents per pound, with an average of 15 cents. Named varieties bring (1916) up to 40 or 45 cents per pound, their cracked-out meats bringing 60 to 90 cents per pound at retail. At these prices they are by far the most valuable nut that can be grown in the United States. Consult United States Department of Agriculture, 'Bulletin 700' (Washington 1916).

PECCARY, the native name of a genus (*Dicotyles*) of small pig-like animals forming the family *Dicotylidæ*, closely allied to the true swine, from which they differ in the character of their dentition and the more complex stomach and some other details. The canine teeth, generally so prominent in the male swine, do not protrude in the peccaries. The bristles are much thicker than in the pig and very long on the throat and head and nape of the neck. The peccaries possess a cutaneous gland, situated on the rump, which secretes an offensive smelling fatty substance. The Indians cut away this pouch immediately on killing a peccary to prevent its contaminating the flesh.

The peccaries form the only indigenous representatives of the swine in America. There are three species of which the collard peccary (*Dicotyles torquatus*) and the white-lipped peccary (*D. labiatus*) are best known. They are said to interbreed readily. The former occurs abundantly in the northern parts of South America, but is found as far south as Patagonia. It is a habitant of Mexico, and is numerous along the Rio Grande, and has spread northward into the United States into Texas and even as far as Arkansas. These animals go either in pairs or in small flocks, and inhabit holes in the ground, or the hollows of trees. The jaguars pursue them with great vigor. Their food consists of maize, potatoes, sugar-cane and similar materials as well as animal matter, and cultivated fields suffer much from their raids. The color of this species, which averages about three feet in length, is a dark gray, the bristles being each marked by rings of gray, straw-color and black, and a white band passes down each shoulder from the withers and round the throat, thus appearing as a kind of «collar.» This species of peccary is readily domesticated. The flesh is savory, but less fat than pigs' flesh. Unlike the pigs but two young are produced at a birth.

The white-lipped peccary, found in Guiana and indeed all through northern South America, and as far north as Honduras, congregates in larger bands than the collared species. They appear to migrate in flocks from place to place, and are said to swim well. They are nocturnal in their habits and often invade plantations in great hordes, causing serious damage. They are also said to attack sportsmen with great courage when exasperated, and to inflict severe wounds with their sharp tusks. A white patch or strip exists across the chin and extends backward on each side of the jaw in this species. They are smaller than the collared peccary, being about 40 inches in length. They are preyed upon by the puma and panther, whom they attack with such energy as to force them to take to trees for safety.

PECK, Annie Smith, American mountain climber: b. Providence, R. I., about 1856. In 1878 she was graduated at the University of Michigan, studied German and music in Germany in 1884–85, and studied in the American School of Classical Studies at Athens in 1885–86, specializing in Greek and archæology. Miss Peck taught two terms in Providence schools; later became preceptress in the Saginaw High School; teacher of mathematics in Bartholomew's School for Girls, Cincinnati; preceptress of the Montclair (N. J.) High School; professor of Latin at Purdue University and at Smith College. She has lectured on Greek and Roman archæology and other subjects since 1887. In 1895 she climbed the Matterhorn, in 1897 the peaks of Popocatepetl and Orizaba and in 1900 Funffingerspitze in the Tyrol. Miss Peck made record ascents in South America as follows: Mount Sorata in Bolivia was ascended to a height of 20,500 feet in 1904, and a peak of the Raura Range in Peru to the height of 18,000 feet in 1908, and Mount Huascarán, Peru, to a height of 21,812 feet the same year, and Mount Coropuna, Peru, to 21,200 feet in 1911. She has written 'A Search for the Apex of America' (1911); 'The South American Tour' (1914; 3d ed., 1917).

PECK, Charles Horton, American botanist: b. Sand Lake, N. Y., 1833. In 1859 he was graduated at Union College, Schenectady, N. Y., became professor in the Sand Lake Collegiate Institute and the Albany Classical Institute. In 1867 Mr. Peck was appointed head of the botanical department of the New York State Museum and in 1883 became State botanist. He published 'Boleti of the United States' (1889); 'Mushrooms and their Use' (1897); 'Plants of North Elba, Essex County, N. Y.' (1899).

PECK, George, American Methodist Episcopal clergyman, brother of Jesse Truesdell Peck: b. Middlefield, N. Y., 8 Aug. 1797; d. Scranton, Pa., 1 May 1876. He began preaching in 1816, was presiding elder of the Susquehanna District in 1824 and in 1835–40 principal of the Cazenovia Seminary. He edited the *Methodist Quarterly Review* (1840–48), and for the succeeding four years was editor-in-chief of the *Christian Advocate,* New York. He held pastorates at Scranton, Wilkesbarre, Providence and Dunmore, and among his books are 'Universalism Examined' (1826); 'Scripture Doctrine of Christian Perfection' (1841); 'Rule of Faith' (1844); 'Reply to Bascom on Slavery' (1845); 'Christian Exertion' (1845); 'Sketches and Incidents' (1849); 'Manly Character' (1852); 'History of Wyoming' (1858); 'History of Methodism within the Bounds of the Old Genesee Conference' (1860); 'Our Country' (1865); 'Life and Times of George Peck,' an autobiography (1874).

PECK, George Record, American lawyer: b. Steuben County, N. Y., 15 May 1843. He was educated in the common schools, served in the artillery during the Civil War, studied law and was admitted to the bar in 1866. In 1871–74 he practised at Independence, Kan.; in 1874–93 at Topeka, and since 1893 at Chicago, Ill. From 1881 to 1895 he was general solicitor of the Atchison, Topeka and Santa Fé Railroad, and from 1895 to 1910 was general counsel of the Chicago, Milwaukee and Saint Paul Railway, since when he has been consulting counsel. In 1905–06 Mr. Peck was president of the American Bar Association. Peck has been a prominent member of the conservative wing of the Republican party.

PECK, George Wilbur, author and State governor: b. Henderson, N. Y., 28 Sept. 1840; d. Milwaukee, Wis., 16 April 1916. He moved to Wisconsin with his parents at the age of three. In his youth he learned the printer's trade and in 1860 bought a half interest in the *Jefferson County Republican,* which was published at Jefferson. He served as a private in the Fourth Wisconsin Cavalry in the Civil War for two and a half years and then returned to his newspaper activities. In 1866 he started at Ripon, Wis., a newspaper called the *Representative* and later became the owner of the *La Crosse Democrat.* He parted with this publication in 1874 and founded the *Sun* at La Crosse. Four years later he removed the plant to Milwaukee and changed the name of the paper to *Peck's Sun,* which became noted because of his humorous sketches, notably the «Peck's Bad Boy» series, favorites generally with boys of a generation ago. His best-known works are 'Peck's Compendium of Fun' (1880); 'Peck's Sunshine' (1882); 'Peck's Bad Boy and His Pa' (1882); 'The Groceryman and Peck's Bad Boy' (1883); 'How Private Peck Put Down the Rebellion' (1885); 'Peck's Boss Book' (1889); 'Peck's Uncle Ike and the Red Headed Boy' (1889); 'Sunbeams — Humor, Sarcasm and Sense' (1900); 'Peck's Bad Boy with the Circus' (1906), and 'Peck's Bad Boy with the

Cowboys’ (1907). Mr. Peck was mayor of Milwaukee (1890–91) and governor of Wisconsin (1891–95). He became the State's executive in the revolt against the plan to make public school attendance compulsory, and after his term in office he returned to his love for printers' ink and for the hunting field, being almost as well known among experts in the shooting of wild fowl as he was among readers for his writings.

PECK, Harry Thurston, American critic and author: b. Stamford, Conn., 24 Nov. 1856; d. 1914. He was graduated at Columbia in 1881, was instructor in that institution in Latin and for a time in Sanskrit, and in 1888 became professor of Latin there, after study at the University of Berlin. He succeeded Prof. Charles Short as Anthon professor. In 1895 he became editor of the American *Bookman*, upon the establishment of that magazine, in 1898 an editor of the ‘International Cyclopædia’ and in 1900 of the ‘New International Encyclopædia.’ He was also at one time literary editor of the *Commercial Advertiser*. Among his publications are ‘The Semitic Theory of Creation’ (1886); ‘Suetonius,’ with commentary (1889); ‘Manual of Latin Pronunciation’ (1892); ‘Roman Life in Latin Prose and Verse’ (1895); ‘The Personal Equation’ (1897); a rendering of ‘Trimalchio's Dinner,’ with introduction (1898); ‘What is Good English? and Other Essays’ (1898). He also edited Harper's ‘Dictionary of Classical Literature and Antiquities’ (1896). He also wrote two successful stories for children, ‘The Adventures of Mabel’ (1889) and ‘Hilda and the Wishes.’ Among his works that stand apart from his classical and encyclopedic productions are ‘Greystone and Porphyry’ (1899), collection of poems; ‘The Life of Prescott’ (1905); ‘Twenty Years of the Republic’ (1906); ‘Literature and Studies in Several Literatures’ (1909), and ‘A History of Classical Philology’ (1911).

PECK, Jesse Truesdell, American Methodist Episcopal bishop: b. Middlefield, N. Y., 4 April 1811; d. Syracuse, N. Y., 17 May 1883. He was educated at Cazenovia Seminary, entered the Oneida Conference in 1832 and was pastor of various churches until 1837, when he accepted an appointment as principal of the Gouverneur Wesleyan Seminary. In 1841–48 he was principal of the Troy Conference Academy at Poultney, Vt., in 1848–52 president of Dickinson College, Carlisle, Pa., and in 1854–58 secretary and editor of the *Methodist Tract Society* in New York. He spent the succeeding eight years in California as pastor and presiding elder. After his return eastward he continued his pastoral work, was one of the founders of Syracuse University and in 1872 he was elected bishop. Among his published works are ‘The Central Idea of Christianity’ (1855); ‘The True Woman’ (1857); ‘The History of the Great Republic from the Christian Standpoint’ (1868).

PECK, John James, American soldier: b. Manlius, N. Y., 4 Jan. 1821; d. Syracuse, N. Y., 21 April 1878. Graduated in 1843 from West Point he took part in the Mexican War and was brevetted major for bravery at Malino del Rey. In 1853 he resigned from the service, but became brigadier-general of volunteers 9 Aug. 1861, and after service in the defensive works of Washington fought in the Peninsular campaign, distinguished himself at Williamsburg and Yorktown, and at Malvern Hill (1 July) was in command of the infantry forces of the Federal rear-guard. Promoted major-general (4 July), he remained until May 1863 in command of the troops left for the defense of the important stragetic post at Suffolk, Va. He defended the position successfully against a superior Confederate force under Longstreet and Hill. Subsequently he was on duty on the Canadian frontier, and on 24 Aug. 1865 was mustered out. He organized (1867) the New York State Life Insurance Company at Syracuse and held its presidency until his death.

PECK, Samuel Minturn, American lyric poet: b. Tuscaloosa, Ala., 4 Nov. 1854. He was graduated from the University of Alabama in 1876 and later studied medicine in New York, but has not practised. He has published in verse ‘Cap and Bells’ (1886); ‘Rings and Love Knots’ (1892); ‘Rhymes and Roses’; ‘Fair Women of To-Day’ (1896); ‘The Golf Girl’ (1899), and in prose ‘Alabama Sketches’ (1902); ‘Maybloom and Myrtle’ (1910).

PECK, Tracy, American classical scholar: b. Bristol, Conn., 24 May 1838. He was graduated from Yale in 1861, studied in Germany, was professor of Latin at Cornell in 1871–80, and occupied the chair at Yale from 1880 to 1908. He was president of the American Philological Association in 1885–86 and director of the American School of Classical Studies in Rome 1898–99. He edited with C. L. Smith a series of Latin authors annotated for college use (12 volumes already issued), and published ‘The Authorship of the Dialogus de Oratoribus’ (1879); ‘Alliteration in Latin’ (1884); ‘Cicero's Hexameters’ (1897), and a large amount of magazine literature. With other writers he annotated numerous college texts. After 1908 he lived in Rome, Italy.

PECK, William Guy, American educator: b. Litchfield, Conn., 16 Oct. 1820; d. Greenwich, Conn., 7 Feb. 1892. He was graduated from West Point in 1844, assigned to the corps of topographical engineers, and served under General Fremont in 1845 on his third expedition to the Rocky Mountains. He was with the Army of the West in the Mexican War, professor at West Point in 1847–55, when he resigned from the army and accepted the chair of physics and civil engineering in the University of Michigan. He was professor in Columbia College from 1857, occupying at his death the chair of higher mathematics and astronomy in both departments of the college. He edited with his father-in-law, Charles Davies, the ‘Mathematical Dictionary and Cyclopedia of Mathematical Science’ (1855), etc., and wrote ‘Elementary Mechanics’ (1859); ‘Popular Astronomy’ (1883).

PECKHAM, Rufus William, American jurist: b. Albany, N. Y., 8 Nov. 1838; d. Altamont, N. Y., 24 Oct. 1909. He studied at Albany and in Philadelphia, was admitted to the bar in 1859. He was a brother of W. H. Peckham (q.v.). In 1868 he was elected district attorney of Albany County for three years; during this time a daring express robbery occurred on the Albany railroad bridge and he successfully prosecuted the robbers and obtained their conviction. He was counsel for the Albany and Susquehanna Railroad in its suit against the Erie, and had charge of several other important cases. In 1881 he became corporation counsel for the city of Albany. An active member of the Democratic party, he was a delegate to the National Convention of 1876, where he supported Tilden for the Presidency, and also to the convention of 1880. He was justice of the New York State Supreme Court from 1883 to 1886, and was associate judge of the State Court of Appeals, 1886–95. In the last-named year he was appointed to the United States Supreme Court by President Cleveland. Consult Taft, W. H., ‹The Anti-Trust Act and the Supreme Court› (New York 1914).

PECKHAM, Wheeler Hazard, American lawyer: b. Albany, N. Y., 1 Jan. 1833; d. New York, 27 Sept. 1905. He was a brother of R. W. Peckham (q.v.). He was educated at Union College, Schenectady, admitted to the bar in 1856. In 1864 he settled in New York, where he acquired a reputation as a constitutional lawyer. He acted with Deputy Attorney-General O'Connor in the prosecution of the «Tweed ring.» He was appointed attorney-general of New York in 1884, but soon resigned.

PECKSNIFF, a hypocritical personage in Dickens' novel, ‹Martin Chuzzlewit.› He is the father of two daughters, Mercy or «Merry,» who married Jonas Chuzzlewit, and Charity, commonly called «Cherry.»

PECKVILLE, Pa., town of Blakely borough in Lackawanna County, on the Delaware and Hudson, the Delaware, Lackawanna and Western and the New York, Ontario and Western railroads, six miles northeast of Scranton. There are numerous coal mines and mining is the principal industry. The town has manufactures of silk, powder, lumber and iron and steel ware. The municipality owns the electric-lighting plant. Pop. 5,345.

PECOCK, pē'kŏk, **Reginald,** English prelate: b. Wales, about 1395; d. Thorney Abbey, Cambridgeshire, about 1460. He was educated at Oxford, in 1431 was elected to the mastership of Whittington College of London, in 1444 was made bishop of Saint Asaph and in 1450 was translated to Chichester. In 1455 he published the ‹Repressor of Over Much Blaming of the Clergy,› a reply to Lollard attacks and a critique of Lollard positions, subtle in argumentation and a pattern of the clear and vigorous English of the time. In a work called the ‹Provoker› he denied the authenticity of the Apostles' Creed, a revised version of which he had previously published. By this and similar writings he managed to secure the disfavor of every shade of belief then prevalent in England. He was cited before Bouchier, archbishop of Canterbury, in 1457, who, after Pecock's creed had been condemned, ordered him to recant on pain of death. He obeyed, retired from his bishopric and went into seclusion at Thorney Abbey. His books, 14 in all, were publicly burned.

PECOS (pā'kōs) **RIVER,** the principal tributary of the Rio Grande of New Mexico and Texas, rising in San Miguel County, N. Mex., at the eastern base of Baldy Peak; it flows south and southeast, enters the State of Texas and empties into the Rio Grande River. In its upper course it flows through a narrow valley, and is one of the most important rivers of New Mexico for irrigation; large storage reservoirs have been built near Carlsbad and Hondo, N. Mex. Its length is about 800 miles, and its volume of water is greatly reduced during the summer months. Its drainage area includes more than 32,000 square miles.

PECTASE, PECTIC ACID, PECTIN. See Pectose.

PECTINIDÆ, a family of swimming bivalve mollusks, comprising about 40 species commonly known as scallops. They are characterized by a shell sub-orbicular, regular, usually with radiating ribs, but sometimes smooth, especially in deep water, beaks approximate, eared, the anterior ones most prominent, the posterior ones a little oblique. Its members have rows of ocelli, very brilliant in some species, and delicate cresentic gills. Most members of the family attach themselves when young by a byssus, but they quickly release this upon occasion and swim away rapidly. Their agility is such that they can leap out of an ordinary pail. The species number about 175, living on sandy bottoms, down to a considerable depth in all parts of the world, and have a large commercial importance. Many fossil forms remain from Palæozoic time. See Scallops.

PECTOLITE (New Lat. «comb-stone»), or **OSMELITE** (Gr. ὀσμή smell, and λίθος, stone; so called because of its peculiar odor), one of the zeolites, a hydrous silicate of sodium and calcium, with the formula $HNaCa_2Si_3O_9$, of a grayish or whitish color and pearly or satiny lustre, commonly occurring in radiated masses of needle-like crystals, suggesting the form of a comb, whence the name. It is occasionally found tabular. It is isomorphous with wollastonite, and was long regarded as a weathered form of that mineral. It is subtranslucent, crystallizes in the monoclinic scheme, is soluble in hydrochloric acid, leaving silica. Its chief alteration product is talc. In hardness it is placed at 4.5 and in density at 2.88. It occurs in the British Isles, in Edinburghshire, Scotland, and in Wales, in Monzoni Valley, Tyrol, at Bergen Hill, N. J., etc.

PECTORAL CROSSES. See Crosses and Crucifixes.

PECTORAL SANDPIPER (*Tringa maculata*) popularly called the «grass snipe,» and erroneously the «jack snipe,» which is a different bird. It is found in wet salt meadows near to but not along the seashore. See Sandpipers

PECTOSE, PECTASE, PECTINE, PECTIC ACIDS, a group of closely related substances, found in the cell walls of certain fruits and vegetables during various stages of ripening and to which the power of forming a jelly is due. They are not crystallizable bodies, but can be precipitated from their solutions in colloidal or gelatinous condition by various reagents. The unripe fruit contains *Pectose* which is insoluble in both water and alcohol, but which can be changed to soluble *Pectine* either by heating with dilute acids, or as during ripening by the action of a ferment-like body called *Pectase,* a substance belonging to the «clotting enzymes.» (See Enzyme). Pectase is always present in the ripening fruit. Pectine is further changed by action of dilute acids or alkalis to a number of different but closely related bodies of rather uncertain composition called the *Pectic Acids.* These pectous substances are composed of carbon, hydrogen and oxygen, exact composition unknown, and related to that section of the carbohydrates, known as the gums. They are insoluble in water, alcohol or acids. Both pectose and pectine may be converted by the enzyme pectase into the gelatinous bodies pectosic acid and pectic acid, consecutively. These acids differ from pectine chiefly in their proportion of water. Pectine swells up and dissolves in water, yielding a viscid liquid which tends to gelatinize as the solution approaches concentration. Pectase is universally present in green plants, being especially abundant in the foliage. It is believed to have some special function connected with the changes taking place in cell membranes during the period of plant growth.

PECULIAR PEOPLE, an English religious sect, who combine certain tenets of the Dunkards and Faith Curists. They are Perfectionists. They claim for themselves the possession of true and undefiled religion, and take their name from a scriptural phrase «a peculiar people» (1 Peter ii, 9). To be a true Christian, with them, is to live without sin, as they profess to do. Their religion has neither mystery or straining effort. They see and can do all things; young and old are equally competent to accomplish this. All are permitted to preach and pray and all who attend their assemblies are members of their church. They reject creeds, sacraments and confessions; they have no ministry. It is one of their fundamental doctrines that James v, 14–15 is to be taken literally, and the British government has sometimes interfered, when their refusal to call in a doctor, or administer medicine, has endangered the life or practically caused the death of some member of the denomination. See RELIGIOUS SECTS.

PEDAGOGY. See EDUCATION, ELEMENTARY; EDUCATION, THE STUDY OF.

PEDAL-POINT, a long-sustained tone in one voice while other voices proceed in independent harmonies. See ORGAN-POINT.

PEDDLER, or **PEDLAR**, a traveling salesman or merchant who carries his goods or merchandise with him from place to place. In most of the United States, peddlers are required to take out a license and to conform to legal regulations, for the protection of the public. In Great Britain peddlers are called hawkers.

PEDEE, pē-dē', **Great**, a river of South Carolina. See GREAT PEDEE.

PEDESTRIANISM. See WALKING.

PEDICELLARIÆ. See ECHINOIDEA.

PEDICULARIS, a genus of herbs of the family *Scrophulariaceæ*, some of which have rather large and finely colored flowers. They have the name louseworts (q.v.) because of an old belief that they produce a lousy disease in sheep. Their acridity renders them obnoxious to sheep; but cattle, goats and swine eat them. Continental Europe and the northern parts of Asia produce many species, as well as North America. *P. sceptrum*, or King Charles' sceptre, is one of the principal ornaments of marshy grounds in northern Europe.

PEDIMENT, *in architecture*, the triangular finishing above the entablature at the end of buildings or over porticoes. The moldings of the entablature bound the inclined sides of the pediment. When there are triangular finishings over doors and windows these are also called pediments. In the architecture of the Middle Ages small gables and triangular decorations over openings, niches, etc., are called pediments.

PEDLAR. See PEDDLER.

PEDOMETER, a small, clock-like mechanism which indicates the distance traveled by a pedestrian. The instrument is so constructed that it moves with the motion of the person carrying it, the indicator advancing one degree for each step taken.

PEDRARIAS DÁVILA. See DÁVILA, PEDRARIAS.

PEDREGAL Y CANEDO, pā-drā-gäl' ē kä-ñā'dō, **Manuel**, Spanish statesman and political writer: b. Grado, in the Adriatic, 1832; d. Spain, 1896. He studied law and entered upon a political career, identifying himself with the Republican party, in the affairs of which he took an active part during the period immediately preceding the abdication of Amadeus I, in 1873. Under the Republican government he was twice Minister of Justice and once Minister of Finance, afterward retiring from public life until 1882 when he became deputy from Oviedo, and with the Republican leaders Azcárate, Salmeron, Labra and others, assisted in organizing the «centralista» which represents the highest principles of the radicals. He wrote ‹El poder y la libertad en el mundo antiguo› (1878); ‹Estudios sobre el engradecimientoy la decadencia de España› (1878); ‹Nociones de hacienda publica› (1881); ‹Sociedades Cooperativas› (1888); ‹Elección presidencial de los Estados-Unidos› (1892).

PEDRO II, pē'dro (Sp. pa'dro), king of Aragon, called THE CATHOLIC: b. 1174; d. Muret, 2 Sept. 1213. He succeeded to the crown in 1196; quarreled with the king of Navarre over his French fiefs; conquered the most of Provence, but gave it up to his brother Alfonso. He married Marie of Montpellier in 1204 and in the same year was crowned by the Pope, a political move calculated to facilitate his projected conquest of the Balearic Islands, and to protect himself against his nobles and the restless Albigensians. He even made Aragon a papal fief, receiving therefor the title of Catholic. In alliance with Castile and Navarre he defeated the Almohades at Las Navas, 16 July 1212. But in 1213 he was defeated and killed at Muret by Simon de Montfort, against whom he fought in alliance with the Albigensians. Pedro II was skilled in Italian and Provençal verse and did much to introduce the Provençal style into Spain.

PEDRO I (ANTONIO PEDRO JOSÉ DE ALCANTARA), called Dom Pedro, king of Portugal and emperor of Brazil: b. Queluz, near Lisbon, 12 Oct. 1798; d. there, 24 Sept. 1834. On the invasion of Portugal by the French in 1807, the royal family fled to Brazil where Dom Pedro became regent of Brazil in 1821. The Cortes angered the colony, a revolution took place and

Dom Pedro, placing himself at the head of the movement, was proclaimed protector and perpetual defender of Brazil. The country being declared independent 1822, he was proclaimed constitutional emperor (12 October) and on 1 December was crowned. In 1825, Portugal recognized the independence of Brazil, and a treaty was made on terms highly unsatisfactory to the Portuguese. His father dying in 1826, Dom Pedro became king of Portugal, but immediately abdicated in favor of his infant daughter, Maria da Gloria, as the Brazilians feared that they were once more to be made dependent upon the mother country. The internal discontent increased, and at length a popular tumult in Rio Janeiro compelled the emperor to abdicate in favor of his son, 7 April 1831, and to return to his native country. In the meantime the crown of Portugal had been usurped by his brother Dom Miguel. He landed at the island of Terceira, in the Azores, issued a decree in favor of Donna Maria, and with the assistance of French and English volunteers began a war which terminated in 1834 in the complete success of the queen's party. On 26 May an agreement was signed by which Dom Miguel was to leave the kingdom forever. He was appointed regent during his daughter's minority, but died before it expired. See Brazil and Portugal, *History*.

PEDRO II (de Alcántara, dä äl-kan'tä-rä), called Dom Pedro II, emperor of Brazil: b. Rio Janeiro, 2 Dec. 1825; d. Paris, 5 Dec. 1891. He was the only son of the Emperor Pedro I, and succeeded to the throne on the abdication of his father 7 April 1831. He married the Princess Theresa Christina Maria, sister of Francis I, king of Naples, in 1843. Brazil prospered greatly under the rule of Pedro II, who was an enlightened ruler and did much to develop its resources in every direction. He was scholarly in his tastes and never sought to employ aggressively even the restricted powers which the Constitution permitted him. During his reign several foreign wars occurred, among them those with the dictator Rosas of Buenos Aires in 1851–52, with Uruguay in 1854–55 and 1864–65 and with Lopez of Paraguay in 1865–70. As a private individual he visited Europe (1871–72) and in 1876 attended the Centennial Exhibition in Philadelphia, being present and assisting at the opening ceremonies. In 1867 Dom Pedro opened the Amazon to the commerce of all nations, and in 1871 a law was passed for the gradual abolition of slavery throughout Brazil; but it was very inefficiently administered. In 1888 a second law was passed providing for the immediate emancipation of the slaves. This turned the rich planters against Dom Pedro who was forced to abdicate in 1889. A pension was granted him by the new Brazilian government and he retired to Paris where he spent the rest of his life. Consult Dawson, T. C., 'The South American Republics' (New York 1903); and Mossé, B., 'Dom Pedro II, empereur du Bresil' (Paris 1899).

PEDRO V, king of Portugal: b. Lisbon, Portugal, 16 Sept. 1837; d. there, 1861. He was the son of Dona Maria II, whom he succeeded under the regency of his father, Prince Ferdinand of Saxe-Coburg-Gotha, in 1853. The most important events of his minority were the conclusion of the extradition treaties with France and Belgium and the commercial treaties with the South American states. The regency of his father ended 16 Sept. 1855 and Pedro devoted himself to strengthening the financial condition of the country and further industrial arts. He died of yellow fever contracted by assisting his plague-stricken subjects in 1861.

PEDRO, Dom, Duke of Coimbra, regent of Portugal: b. Lisbon, Portugal, 9 Dec. 1392; d. Alfarrobeira, Portugal, 20 May 1449. He was the second son of John I of Portugal; while very young commanded the first expedition against Ceuta. He spent four years 1424–28, in travel and visited even the court of Bagdad where he was received with high honors. After the death of Edward I the people became dissatisfied with the regency of the queen and Pedro skilfully contrived his own appointment to the office. He proved a wise and tactful ruler and arranged the marriage between the young king Alfonso V, and his daughter Isabelle in 1446. After the accession of the king a quarrel arose between Pedro and his brother, the Duke of Bragança, over the office of constable of the kingdom. The king took the part of Bragança, a civil war ensued and Dom Pedro was killed in battle at Alfarrobeira.

PEDRO THE CRUEL, king of Leon and Castile, not to be confused with Pedro IV of Aragon, who was called «the Cruel,» but more commonly «the Ceremonious»: b. Burgos, 30 Aug. 1334; d. near Montiel, 26 March 1369. He was son and successor (1350) of Alfonso XI, whose mistress, Leonor de Guzman, he imprisoned, and whose illegitimate children he persecuted cruelly. He was married to Blanche of Bourbon in 1353 and abandoned her in three days. The following year he married Juana de Castro and left her at the end of two days. These two desertions made him many enemies, for the friends of both women openly opposed and joined forces with his brothers who were in open rebellion. His general administration of Castile was very severe. On the death of the Seigneur of Biscay, Pedro imprisoned the two daughters and sought the life of the three-year-old son of the Seigneur, seized the province and killed Garcilasso de la Vega, who attempted to interfere. He murdered his brother Fadrigue and the king of Grenada, while the latter was his guest, and picked a quarrel with Pedro IV of Aragon (also styled «The Cruel»), who called in the help of the Castilian king's natural brother Henry of Trastamare at the head of the famous mercenaries, the White Companies. This war with Pedro IV continued from 1357–61. Henry established himself as king of Castile in 1366. He had been in exile in France; but headed a body of exiles and another of mercenaries and was openly backed by the Pope, France and Aragon. Pedro persuaded Edward the Black Prince to espouse his cause; and the latter invaded Castile in 1367 and defeated the exiles at Nájera. He and Pedro disagreed over the treatment of prisoners and other matters, and Edward went back to Guyenne where he was governor. Rebellious bands and parties sprang up everywhere. Henry returned, headed the new opposition and defeated Pedro at Montiel in 1369. Pedro was treacherously killed a few days after the battle. Consult Burke, 'History of Spain' (1895); Mérimée, 'Histoire de Dom Pedro I, Roi de Castile' (1843); and

Garcia, 'Castila y Leon durante los reinados de Pedro I, etc.' (1891).

PEDRO SANCHEZ. 'Pedro Sánchez' of José María de Pereda centres in autobiographical form about political life in Spain during the middle of the last century. It is one of the few novels of Pereda which deal essentially with life outside of his favorite Cantabrian hills and coast. Even so, the disillusioned hero after struggling as journalist and political office-holder at Madrid and in a provincial town, returns to his native village of the north. Furthermore the story of Pedro's youth affords the author an opportunity for describing the country about Santander. Pereda's dramatic account of the Revolution of 1854 in Madrid is told at first hand, for he spent his student days there during that period. As in all Pereda's novels the ethical and moral questions of life predominate in 'Pedro Sánchez' but do not obtrude. Pereda, a realist, paints life as he sees it, and although he may be prejudiced in favor of rural life against city life with its artificial manner of existence and its temptations, in the main his strictures do not seem exaggerated. 'Pedro Sánchez' is a forceful satire on the mania for office-holding in Spain. Through the hero we can see the author, a rugged, honest, and somewhat reactionary don flaying political corruption. The novel is written in Pereda's purest style. Pereda is one of the greatest stylists in Spanish literature, and must be counted among the masters of modern Spanish fiction. There is an abridged American edition with notes, vocabulary, and a full account of the author and his work with a bibliography by R. E. Bassett, taken from the standard edition of Pereda's works (Vol. XIII).

SAMUEL M. WAXMAN.

PEEBLES, pē'blz, **James Martin,** American physician and editor: b. Whitingham, Vt., 23 March 1822. He was graduated from the University of Pennsylvania, receiving the degrees of M.D. and M.A., and then pursued his studies further at the University of Chicago. He has owned and edited several newspapers, and in 1869 was appointed United States consul to Trebizonde, Turkey. He was president of the California College of Science for four years and of the Cincinnati Eclectic College for three years. Dr. Peebles was also the organizer of the Independent Order of Good Templars, and the first grand chaplain of this order. He represented the United States Arbitration League at the International Peace Commission of Europe. A member of many national institutions of science and learning, Dr. Peebles encircled the world five times, lecturing on travels, hygiene, spiritualism and social reform. He was president of Peebles College of Science and Philosophy (1914). Of his many books and pamphlets may be mentioned 'Seers of the Ages' (1875); 'Immortality and our Homes Hereafter' (1880); 'How to Live a Century and Grow Old Gracefully' (1884); 'The Demonism of the Ages' (1902); 'The Christ Question Settled' (1897); 'Vaccination—A Curse' (1905); 'The Spirit's Pathway' (1906); 'Five Journeys Around the World' (1907); 'Buddhism and Christianity Face to Face' (1909); 'Spirit Mates — Marriage and Divorce' (1909); 'Death Defeated' (1910); 'How to Converse with the Dead' (1911); 'Ninety Years Young and Healthy — How and Why' (1913).

PEEBLES, Mary Louise Parmalee ("LYNDE PALMER"), American author: b. Lansingburg, N. Y., 10 Dec. 1833; d. 26 April 1915. She was graduated from the Lansingburg Academy in 1850 and in 1862 was married to Augustus A. Peebles. As a writer of juvenile books she has gained some reputation and among her works are 'The Little Captain' (1861); 'The Good Fight' (1865); 'Drifting and Steering' (1867); 'Jeannette's Cisterns' (1882); 'Where Honor Leads' (1894), etc.

PEEKSKILL, pēk'skil, N. Y., village in Westchester County, on the Hudson River, and on the New York Central and Hudson River Railroad, about 40 miles north of New York City. It is connected by steamboats with New York, Albany and all the Hudson River ports. Because of its population, Peekskill is called "the largest village in the country," the inhabitants considering the village form of government to be the most advantageous. The village president and the board of trustees serve without compensation. Peekskill is noted for its long established industries and its manufacturing and commercial activities. Railroad and deep water facilities offer great advantages for manufactories. Its 65 industries employ about 2,750 operatives. Among manufactured products are stoves, underwear, nightwear and dress goods, machines and engines, automobile parts, oilcloths, hats, cigars, yeast, vinegar, fire-bricks, bricks, charcoal products, cement blocks and reconstructed stone. A government shipyard is in operation here. Dairy farming on the most modern principles is also a flourishing industry of the neighborhood. The Westchester County National Bank and the Peekskill Savings Bank are two prosperous institutions. Saint Peter's, or the "Old Church," was erected in 1767, and there General Washington as a lay reader of the Episcopal Church read services for his men when his army was stationed in the vicinity. Saint Gabriel's Episcopal Academy for girls is a noted educational institution, and besides two high schools, eight elementary and parochial schools, there are business schools and a training school for nurses in connection with the Peekskill Hospital. The Peekskill Military Academy, Westchester Military Academy, Mohegan Lake School and Worrall Hall Military Academy are located here, and other public institutions of interest are Saint Joseph's Catholic Home for boys and girls, over 1,000 inmates; the House of the Good Shepherd, a reformatory for girls, and Nazes Memorial Home for Children. The Field Public Library has over 7,000 volumes. There are municipally owned welfare stations, Y. M. C. A. and Y. W. C. A. organizations, theatre and movie houses. Well-equipped police and fire departments are maintained, with most of the fire apparatus motorized. The water supply is an important village asset, with 30 miles of mains yielding a daily capacity of 5,000,000 gallons and a daily consumption of 3,750,000 gallons; 15 miles of trolley lines give regular transport service; there are 33 miles of sewer mains; and gas, electric lighting and power service are unlimited for private and industrial needs. The property values are estimated at $9,001,625.70, Peekskill village covers an area of six square miles of picturesque location, surrounded by famous country estates. The town maintains Depew Park, covering 67 acres, and named after ex-Senator Chauncey M. Depew (q.v.), who was born here. The former farm and summer home of Henry Ward Beecher lies two miles east of the village. At Verplanck's Point, two miles below Peekskill, Hendrick Hudson anchored the *Halfmoon*, October 1609, and there his sailors had their first encounter with the Indians. Peekskill was settled in 1664 by the Dutch. The Indians had here a village called Sachoes, but the Dutch changed the name in honor of Jans Peek, a Dutch navigator. In 1665 royal confirmation was given and the territory was known as Ryck's Patent. In 1764 several families from England settled here. During the Revolutionary War, Fort Independence, just above the village, was occupied by American soldiers. Continental Village, a fortified camp a few miles northeast, was for a time the headquarters of Generals Parsons and Putnam. It was in Peekskill that Arnold heard of the capture of André. John Paulding, the captor of André, is buried there in old Rural cemetery. Gallows Hill, in whose «Wayside Inn» André was detained after his capture, is about three miles distant. On the north side of Gallows Hill is the spring from which the Mohicans drank. Pop. 18,000.

PEEL, Paul, Canadian artist: b. London, Ontario, 1860; d. Paris, 25 Oct. 1892. He studied at the Philadelphia Academy of Fine Arts, in 1880 entered the Royal Academy at London, and later at Paris was a pupil of Boulanger and Gérôme. His studio was at Paris, and his work was French in its characteristics. He had a very delicate sense of coloring, and his landscape effects were notably light and airy. His 'How Bitter Life Is' obtained honorable mention at the Salon of 1889. Among his other works are 'Two Friends'; 'Fording the Stream'; 'In Punishment'; and 'The Unexpected Meeting.' In 1890 his 'After the Bath' was awarded a gold medal. It was purchased by the National Gallery of Budapest. Queen Alexandra secured his 'Two Friends' for Buckingham Palace, while the city of Toronto purchased his 'Fording the Stream,' which is now in the city hall of that city.

PEEL, Sir Robert, English statesman: b. near Bury, Lancashire, 5 Feb. 1788; d. London, 2 July 1850. He was graduated from Oxford in 1808; in 1809 entered Parliament as Tory member of Cashel, later exchanged for Chippenham, and in 1810 made his first speech in seconding the address to the throne. In 1811 he entered upon his official career as Under-Secretary of State for the Colonies, but in 1812 he was transferred to the Chief Secretaryship for Ireland, a post whose usual difficulties were at that time much increased by political disturbances. He greatly improved the routine administration of the office, promoted secular education, and for the security of life and property established the Irish constabulary, thence known as «Peelers.» But his Tory views and his opposition to Catholic emancipation dissatisfied the extreme members of the Catholic party who generally referred to him as «Orange Peel.» In 1817 he was returned for Oxford, thus obtaining the chief parliamentary distinction in the Tory party; and in 1818 he resigned the Irish secretaryship, whose peculiarly exacting labors he had long since found distasteful. He became chairman of the bullion committee in 1819, and on 24 May, in one of his great speeches, carried resolutions for a return to cash payments, in place of the depreciated paper then in circulation. In so doing he differed somewhat from his party, but established his reputation as a financier. He was made Home Secretary in 1822 and secured an important reform in British criminal law, thus making effective the endeavors of Sir Samuel Romilly and Sir James Mackintosh; and in 1827 he retired from the ministry. In 1828 he became Home Secretary in Wellington's Tory ministry and leader of the House. He made large retrenchments in expenditures, allowed the importation of corn under a sliding tariff-scale, and by the new Metropolitan Police Act reorganized the London force (thence known as «Peelers» and «Bobbies») after the manner of the Irish constabulary. But the cause of Roman Catholic emancipation had now arrived at a point where the ministry must either support it or resign. For the sake of an expedient settlement of the question, the former course was decided upon, and «Orange Peel» in a speech of more than four hours (5 March 1829) introduced the measure. This change in attitude lost him his seat as representative of Oxford (1829). He relinquished his ministerial post when the Tories were driven from power in 1830, and upon the formation of a Whig ministry became the leader of the opposition. He resisted the Reform bill with much adroitness, and when it had been passed in 1832, organized a powerful opposition in the Conservative party, and by a temperate policy gradually regained for modified Tory principles the influence of which Liberal advance had threatened to deprive him. In 1834 he formed with Wellington a cabinet, becoming First Lord of the Treasury and Chancellor of the Exchequer. But in 1835 he was beaten and resigned, but in 1841 he again became Prime Minister as First Lord of the Treasury, and at once proceeded to a thorough reorganization of the finances. In 1842 he carried a tariff measure based on the sliding-scale in operation since 1828; and in the same year a bill for the imposition of an income-tax. By 1845 a surplus of £5,000,000 had replaced a deficit of £2,000,000. The potato-rot in Ireland and consequent famine made cheap corn a necessity, and the activity of the Anti-Corn Law League led Peel to declare in favor of the repeal of the laws. Some of his colleagues disagreed, and he resigned; but he was soon once more in power, and on 27 Jan. 1846 presented the repeal to the House. The measure was passed, but protectionists brought about his defeat on the Irish coercion bill, and he resigned. He gave a general support to the Whig ministry of Lord John Russell, and in the critical time of 1847 he was one of the strongest supporters of the government which he backed up in its free-trade policy, and supported in its efforts to do away with the Jewish disabilities by process of law. On 28 June 1850 he made a speech in opposition to Palmerston's interference in the Greek question; and on the following day he was thrown from his horse while riding through Hyde Park and died from the effects of the fall.

Peel was an eminent statesman and parliamentary leader. In many notable ways he furthered justice and practical reforms, and his foreign policy was wise and pacific. He was noted for private charities and made an important collection of paintings.

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PEELE, pēl, **George,** English dramatist and poet: b. Devonshire, about 1558; d. about 1598. He was educated at Oxford, ultimately settled at London as a writer for the stage and was also known as an accomplished actor. He was the associate of Nash, Marlowe and Greene. Of the many dramas of which he was reputed to be the author only a few are certainly known to be his, among these being 'The Arraignment of Paris'; 'The Chronicle History of Edward I' (1593); 'The Old Wives' Tale' (1599); 'David and Bethsabe' (1599). He wrote several pageants, and he also produced other miscellaneous writings from some of which Shakespeare may have borrowed. His blank verse, though often tedious, not seldom rises to something like real grandeur and force, and throughout his works many extremely beautiful lyrics will be found. His writings helped to prepare the way for Shakespeare. His works, edited by Bullen, appeared in 1888. Consult Ward, 'History of English Dramatic Literature.'

PEELE, John Thomas, Anglo-American artist: b. Peterborough, England, 1822; d. 1897. He early came to the United States, began portrait painting, but later took up genre-work, in 1846, set up a studio at New York, and in the same year was made a National academician. In 1851 he returned to England, and there he afterward worked. His paintings numbered among others 'Music of the Reeds' (1857); 'Highland Supper'; 'Village School'; 'A Bit of Gossip'; and 'The Bird's Nest.'

PEEP-O'-DAY BOYS, a name given to the Irish revolutionists of 1784. (See ORANGEMEN.) They were so named from visiting the houses of their enemies at daybreak in search of arms.

PEEPER, a popular name for several species of the family Hylidæ or tree-frogs, which make a peeping noise in the early spring, when they go to the water for breeding purposes. The title belongs particularly to the small yellowish thin-voiced Pickering's tree-frog (*Hyla pickeringii*), common over all the eastern United States and in Canada westward to Manitoba. This little frog hibernates during December and January and in very cold seasons through part of February. His is the first voice heard in the spring, either late in February or early March, and he continues "peeping" until the second or third week in May, at which time the other tree-frogs begin their piping. The peeper ranges in color from a light fawn color to a deep wood-brown, and his color varies according to the color of the place where he sits. He is marked with an oblique cross on his back and bars on his hind legs. In size he rarely reaches more than an inch in length. The peeper will become quite tame and may be kept quite successfully in a mossy fernery if fed properly. These little frogs eat prodigious numbers of mosquitoes and gnats, and are themselves eaten by larger frogs. See TREE-FROGS.

PEEPING TOM, a common name for an inquisitive person. It was originally "Peeping Tom of Coventry," a person who disobeyed the injunction not to look in the street when Lady Godiva (q.v.) rode by.

PEEPUL, PIPUL, PIPPUL, BO-TREE, or **SACRED FIG,** an East Indian tree (*Ficus religiosa*) of the order *Urticaceæ*. It often attains a height of 100 feet, bears heart-shaped leaves with attenuated points which act as drainage for dew in moist tropical forests. The fruits, which are about the size of a gooseberry, are little used for food. The trees are frequently planted around Hindu temples because tradition says that Vishnu was born under one of these trees, hence their sacredness. Buddhists revere this tree. It is a favorite food-plant of the lac insect and is valued on that account also. Its juice is used as bandoline and as a source of caoutchouc. As an ornamental tree it is specially attractive because the leaves upon their long slender petioles move with the slightest breeze.

PEER GYNT. Ibsen's 'Brand' preached the philosophy of "All or nothing." Relentless, cruel, resolute, overriding in will, Brand went *through* everything that stood in his way toward gaining an ideal. Another play was needed as a compensating balance, as a complementary color to 'Brand.' That is exactly what 'Peer Gynt' is. Instead of the iron will of Brand, Peer is will-less; instead of sufficient, he is insufficient; instead of resolute, irresolute. In all issues facing him, Peer goes *around*. 'Brand' was published in Copenhagen, 15 March 1866. By December it had reached its fourth edition. The play had a phenomenal reading success, and people became curious to know what Ibsen's next play would be. The dramatist, about this time, was relieved of financial worry by two money grants, one from the Norwegian government and the other from the Scientific Society of Trondhjem. This enabled him to give to his work an unfettered mind. He went with his family to Frascati, where, in the Palazzo rooms, he looked many feet down upon the Mediterranean, and pondered his new drama. He was soon writing to his friends of its imaginative character. The scenario for 'Peer Gynt' and the first act were completed by 5 Jan. 1867. The details had been planned carefully, and folklore mixed with experience became the matrix for the inconsequent Peer's adventures. Ibsen's own studies in regional folktales had given him a goodly stock to draw from; and there are touches of family history in the play which are less evident than

Ase, who was a rough portrait of Ibsen's mother. This is his most fantastic piece, the one with the most formlessness about it. In it there are germs of ideas worked out more fully in later plays. Peer, the poet and dreamer, has none of Brand's polemics about him. If the world were full of lovable rascals like Peer, who dreams of being what he is not; or full of Stoics like Brand, inflexible, rentless, uncompromising — there would be little human progress.

Ibsen preserved a profund silence about the content of this drama. He begged of his publisher, Hegel, to create as much mystery about it as possible. In his workmanship he became reckless with imagery. That is why 'Peer Gynt' is so formless. He carries Peer from abandoned youth to senile old age in scenes of wild riot. This hero fights his way among nixies, wrestles in the coils of the Boyg — symbol of his own indeterminateness and confusion. He cares nothing for consequences, even though the Green-Clad Woman confronts him with an Ugly Brat, symbol of his lust. Out of sight, out of memory, that is the tragedy of Peer's romance with Solveig. And when the Button-Molder finally calls him to accounting — as Death, in the morality, calls to Everyman, Peer suddenly realizes that he has been a bungler of life, with his motto, «To thyself be enough.» In the end, however, he is cleansed in the faith and hope and love of Solveig. 'Peer Gynt' was issued 14 Nov. 1867, and the Norwegian public hailed it vociferously. The critics, in some quarters, were uncompromising in their censure, some sneering at the poetry of it. Whereupon, Ibsen wrote his now famous message: «My book *is* poetry, and if it is not, then it will be. The conception of poetry, in our country, in Norway, shall be made to conform to the book.» Many read satire into the play; others read into it motives never intended. So contrary were the views, that Ibsen threatened to write an autobiographical interpretation of it. «Why cannot they read it as a poem?» he queried. That is the way it should be regarded. Even Ibsen used to confess that neither 'Brand' nor 'Peer Gynt' was intended by him for the stage. In 1874, however, he was arranging with Edvard Grieg for the music now so widely famous as the Grieg Peer Gynt Suite; but for the purposes of the music he was considering an adaptation of his original text. In 1906 scenes from the play were given by the Progressive Stage Society of New York; but to Richard Mansfield is due the credit for the authentic American performance of 'Peer Gynt,' at the Chicago Grand Opera House, 24 Oct. 1906. The stupendous task of preparation for a drama so dependent on its external scene for illusion undoubtedly added to the strain on the actor's health, resulting in his death the following summer. There are three supreme figures that stand as creative epitomes of the Stoic, the Fantasist and the Romanticist. These are Brand, Peer Gynt and Don Quixote. Ibsen's two plays will come into their true position long after 'A Doll's House' and 'Hedda Gabler' are dated and outworn.

MONTROSE J. MOSES.

PEER AND PEERAGE. The original sense of the word «Peer» was one of equal rank, qualities, endowments or character and it is often used with this signification in English literature as far back as the time of Chaucer. It is also frequently used in the sense of companion, associate or fellow. In Great Britain peer signifies a nobleman; in France the term formerly signified those who had a seat in the upper house. The dignity and privileges of peers originated with the growth of the feudal system. In the feudal system the principle was developed that every association should take care of its own affairs, including the judicial decision of disputes among themselves and with their superiors; and it became an obligation as well as a privilege of the vassal to appear at the court of the immediate lord on days of state and of the administration of justice. In France, at the time of the revolution by which Hugh Capet ascended the throne in 987, there were but seven secular prices immediate vassals of the Crown. When the Duke of France became king there remained but six, to whom were added the archbishop of Rheims as spiritual primate of France, and the bishop of Laon, with the title of duke, those of Beauvais, Noyon and Chalons, with that of count; and at a later period, under Louis VII, also the bishop of Langres, because their dioceses were situated within the immediate domains of the Crown. The ancient principalities of peers were by degrees united with the crown; only the spiritual lords maintained their titles. Richelieu, backed by Louis XIV, reduced the privileges of the peerage practically to a question of precedence. The peers were still permitted to be judged by the higher courts and to sit in Parliament. The revolution of the 18th century abolished the French peerage, but Louis XVIII re-established it after the model of that of England by the charter of 1814. In 1831 hereditary peerages were abolished in France.

In England the peerage originated as in France. This dignity belongs to the five degrees of nobility (duke, marquis, earl, viscount and baron), by right, which was not the case with the French nobility, though the idea of *mésalliance* does not prevail by any means to the same extent in England as on the continent of Europe. In the beginning all the Crown vassals appeared at court on the days of state, and attended the diets; afterward only those who were summoned to appear by writ. This custom grew at length into a rule, and the summonses were considered proofs of hereditary peerage. There is one lordship — the borough of Arundel — which confers the dignity of earl on its possessor by prescription. In regard to all other titles the peerage is personal, and descends in a direct line from male to male. The chief privileges of peers are that of a seat in the House of Lords, of a trial by persons of noble birth in case of indictments for treason and felony, and misprision thereof, and of exemption from arrest.

The House of Peers (or Lords) of Great Britain consists of all peers of the United Kingdom; the representative Scottish peers elected for each Parliament; the Irish representative peers elected for life and the lords spiritual. Many of the peers of Scotland and Ireland are also peers of England, Great Britain or the United Kingdom and hold their seats in the House of Lords under one of these titles. The peers of the United Kingdom are those of prior to 1707 and those of Great Britain from 1707 to 1 Jan. 1801. See PARLIAMENT.

PEERYBINGLE, pē'ri-bĭng-gl, **Mrs.,** in Dickens' 'Cricket on the Hearth,' the wife of John Peerybingle, a carrier. She is a cheerful little woman, whom her husband calls «Dot.» This pet name Dion Boucicault made the title of his dramatization of the story (1862).

PEET, Harvey Prindle, American educator: b. Bethlehem, Conn., 19 Nov. 1794; d. New York, 1 Jan. 1873. He was graduated at Yale in 1822, and in 1824 became superintendent of the American Asylum for the Education of the Deaf and Dumb at Hartford, the first institution of its kind in the United States. In 1831 he was appointed president of a like institution in New York which position he occupied until 1868 when he resigned. He found the supply of suitable books for use in his work decidedly insufficient and in 1844-46 published 'A Course of Instruction for the Deaf and Dumb' which came into general use. His other writings include 'Legal Rights of the Deaf and Dumb' (1856), and other works on deafness and insanity.

PEET, Stephen Denison, American archæologist: b. Euclid, Ohio, 1830; d. 1914. In 1851 he was graduated at Beloit College and in 1851-53 was a student at the Yale Divinity School and in 1854 was graduated at Andover Theological Seminary. In the following 40 years he held pastorates in Wisconsin, Ohio and Illinois and in 1895 removed to Chicago. In 1878 he founded the *American Antiquarian and Oriental Journal,* which he edited until his death. His published works are 'The Clan Centres and the Clan Habitat of the Effigy Builders' (1891); 'The Mound Builders: Their Work and Relics' (1892; 2d ed., 1903); 'The History of the Explorations in the Mississippi Valley' (1896); 'Prehistoric America' (3 vols., 1890-99); 'Ancient Monuments and Ruined Cities' (1904); 'Myths and Symbols' (1905); 'Aboriginal Religions in America' (1905).

PEEWIT, a name applied in some parts of England to the lapwing plover (*Vanellus cristatus*); and similarly sometimes to the black-headed gull (*Larus ridibundus*). See GULLS; LAPWING.

PEFFER, William Alfred, American statesman, journalist and author: b. Cumberland County, Pa., 10 Sept. 1831; d. 1912. He was engaged in farming in Indiana and Missouri; but being forced to leave there on account of his open support of the Union, he went to Illinois in 1862 and enlisted in the Federal army, where he was promoted to the rank of first lieutenant, and served as adjutant, judge-advocate and quartermaster. Mustered out in 1865, he settled in Clarksville, Tenn., and began the practice of law. In 1870 he moved to Kansas, where he continued his law practice, and established the *Fredonia Journal* and *Coffeyville Journal.* In 1874 he was elected to the State senate, and was chairman of the legislative committee on the Centennial Exhibition in 1876. In 1880 he was a presidential elector on the Republican ticket, and in 1881 he became editor of the *Kansas Farmer,* in which he advocated government control of railroads, the free coinage of silver and reduction of the rates of interest, and opposed national banks and monopolies. Through his advocacy of these measures he became one of the founders of the People's party, and in 1891 was made the president of the national conference of that party at Cincinnati. In 1890 he was elected to the United States Senate on the Populist ticket; during his term he was chairman of the committee on civil service, and was a member of the select committee on woman's suffrage. He maintained that the farmers ought to control the politics of the country. He subsequently allied himself with the Prohibition party and was their candidate for governor of Kansas in 1898. He has written 'Geraldine, or What May Happen' (1888); 'Peffer's Tariff Manual' (1888); 'The Way Out' (1890); 'The Farmer's Side' (1891); 'Americanism in the Philippines' (1900); 'Rise and Fall of Populism in the United States' (1900).

PEG WOFFINGTON, a novel by Charles Reade, published in 1852, and subsequently dramatized under the title 'Masks and Faces.' This delightful tale of 18th century manners opens in the green-room of Covent Garden Theatre, where the Irish actress, Margaret Woffington, in the heyday of her fame and beauty, tricks the entire dramatic company, including Colley Cibber, the famous playwright and comedian, by personating the great tragic actress, Mrs. Bracegirdle.

PEGASUS, (1) *in Greek mythology,* a winged horse, the offspring of Poseidon and Medusa, which sprang from the body of the latter when Perseus struck off her head. He was called Pegasus because he was supposed to have made his appearance near the sources of the ocean. Pegasus was caught at the spring Pirene, in Corinth, by Bellerophon who made use of him in his conflict with the Chimæra and in subsequent wars. He was believed to have flown up to heaven and to have taken his place among the stars. But he left behind him traces of his residence upon earth. One of these long existed in the shape of the Hippocrene spring on Mount Helicon, which was popularly believed to have been caused by a blow from Pegasus' hoof. The same story is told of several other fountains in Greece. The muses of Mount Helicon are represented as paying special honor to Pegasus for his gift. Pegasus, in later days, became the steed on which the poet is carried into the realms of poetic fancy. (2) *In astronomy* the Flying Horse, one of the 20 ancient northern constellations, bounded on the north by Lacerta and Andromeda, on the south by Aquarius, on the east by Pisces and on the west by Equuleus and Delphinus. It is on the meridian in September at midnight. Alpha Pegasi is Markab, Beta Pegasi is Scheat and Gamma Pegasi is Algenib. These with Alpha Andromedæ constitute the great square of Pegasus.

PEGGOTTY, pĕg'ō-tĭ, in Dickens' 'David Copperfield,' a family name, belonging especially to Clara Peggotty, the faithful nurse of David, who always addresses her by that surname. The other members of the Peggotty family are Clara's brother Dan, a retired sailor, and her nephew Ham, a Yarmouth boatman. With Little Emily and Mrs. Gummidge they all live in an old barge which they have converted into a tolerable dwelling.

PEGMATITE, a very coarse granitic rock, composed essentially of lamellar feldspar and quartz, frequently with white mica and sometimes tourmaline and garnet. Pegmatite is distinguished by the irregularity of its texture, the larger crystals together in one part and the smaller in another. The quartz will often be found in segregated masses with the tourmaline or garnet. Syenitic pegmatite is almost wholly of alkali-feldspar. Pegmatite occurs usually as a dike traversing other forms of igneous and crystalline rocks. It is best known commercially from its use as a source of feldspar in the manufacture of porcelain.

PEGOUD, pĕ'goo, **Adolphe**, French aviator: b. about 1883; d. 1915. In 1913 Pegoud became famed for his flying feats. He was the first aviator to fly his plane upside down and to loop the loop in the air. At the outbreak of the war with Germany in 1914 he joined the aviation corps of the French army. He was awarded the military medal in March 1915, and in April 1915 shot down a German Taube making prisoners its pilot and observer. Pegoud was officially credited with the destruction of six German planes when he himself was downed by the foeman.

PEGRAM, pē'grăm, **George Herndon**, American civil engineer: b. Council Bluffs, Iowa, 29 Dec. 1855. In 1877 he was graduated at Washington University and became construction engineer of the Utah and Northern Railway; was principal assistant of C. Shaler, bridge engineer in 1878–80 and chief engineer of the Edge Moor Iron Company of Wilmington, Del., in 1880–86. In 1886–89 he was consulting engineer at New York; in 1889–93 consulting engineer of the Missouri Pacific system and from 1893 to 1898 chief engineer of the Union Pacific system. In 1898–1903 Mr. Pegram was chief engineer of the Manhattan Elevated Railroad and since 1903 has been chief engineer of the Interborough Rapid Transit Commission and after 1912 also of the New York Railways Company. Mr. Pegram designed the Kansas City Elevated Railroad and the Union Station at Saint Louis and designed and built combined highway and railway bridge across Arkansas River at Fort Smith, Ark. In 1917 he was president of the American Society of Civil Engineers.

PEGRAM, John, American soldier: b. Petersburg, Va., 24 Jan. 1832; d. Hatcher's Run, Va., 6 Feb. 1865. He was graduated from West Point in 1854, appointed to the First Dragoons and in 1857 was made first lieutenant. He was assistant instructor of cavalry and in 1857–58 accompanied the Utah Expedition. In 1860 he served against the Indians in Mexico and at the outbreak of the Civil War resigned his commission (10 May 1861) and entered the Confederate army, where he was appointed captain of cavalry. He was captured at Rich Mountain, and after his exchange was appointed chief of engineers under General Bragg in Mississippi, later becoming chief of staff to Gen. Kirby Smith in Tennessee. In 1862 he was commissioned brigadier-general of cavalry, was engaged at Murfreesboro and commanded a division at Chickamauga. He was promoted to major-general and given command of General Early's former division in the Army of Northern Virginia, fought in the battle of the Wilderness and against Sheridan in the Shenandoah Valley in 1864. He was fatally wounded in the battle of Hatcher's Run, near Richmond.

PEGU, pĕ-goo', Lower Burma, (1) ancient Malay kingdom, dating back to the 6th century, when the city of Pegu was built, destroyed in the 18th century, but rebuilt and from 1754 to 1852 a dependency of Burma, and now under British control as (2) a division of Lower Burma, with an area of 13,257 square miles and population of about 1,850,000, including five states or districts, namely, Rangoon, Hanthawadi, Tharawadi, Prome, (3) Pegu, the largest district of the division, with an area of 4,276 square miles and a population of about 350,000, mostly Buddhists. Rice is the principal crop of the surrounding country. In the district is the famous temple of Gautama Schwema-da, which its priests say is more than 2,300 years old. Rangoon is the largest city. (4) Pegu, town formerly the capital of Lower Burma, on the Pegu River, 47 miles by rail northeast from Rangoon. It has a population of 17,000, and is the terminus of a railroad running through Sittang and Thaton to Martaban, opposite the port of Moulmein. The town is noted for its great pagodas, some of them in ruins, and for the colossal recumbent statue of Gautema, 181 feet in length and 46 feet high at the shoulder; and other colossal figures representing Buddha and his predecessors. (5) Pegu, a navigable river rising in the Pegu Yomas, a range of hills (2,000 feet) dividing the valleys of the Irrawadi and Sittang rivers. It runs a course of 175 miles, and empties into the Rangoon River just below the city of Rangoon.

PEHLEVĪ LANGUAGE AND LITERATURE. The word is also written Pahlavī, Pahlevī; etymologically from Parthian, Parthava, Pahlav. It is the name given by Zoroastrians to the ancient translations of the sacred scriptures of that creed. Firdûsi, the great poet, mentions that Pehlevī books furnished him with many of his narratives. Ibn Mokaffa, the learned Arabian, speaks of Pehlevī as an idiom of Persia. It was, however, as has now been established, less an idiom than a mingling of Arabic and ancient Persian, as it was employed during the Sassanide dynasty — Semitic (Aramaic) and Aryan (Zend) vocables being in an almost hopeless jumble, often Arab words with Persian endings, etc., and it is largely for this reason that many writers have reserved the term Pehlevī merely for that system of writing. To speak of this first, then, Pehlevī writing is a species of Arab adapted to Persian. The character of this mode of writing is cursive and very ambiguous, easily leading to misapprehension and misinterpretation. Thus, for the letters *n*, *u*, *r* there is but one character, and so there is but one for *y*, *d*, *g*. It was, to put it in another form, on the surface at least, an attempt to represent Persian consonantal and vowel sounds by Arabic signs, a manifest impossibility. That explains, too, the arbitrary manner of expressing the Persian sounds by this means.

But all this shows but the seeming facts. In reality Pehlevī was pure Persian, though disguised in the writing of it to appear a barbarous mixture of Arabic and Persian. Thus, some 400 or 500 Arabic words were in it written in Arabic characters, and when thus pronounced certainly represented Arabic words. These words, however, comprised the stock of very common, everyday vocables, such as «house,» «king,» «horse,» «food,» etc. But the Persians in reality in reading them substituted for these words their own Iranian ones, making, for example, out of the Arabic «bisra» (meat) the purely Persian «gosht.» This supply of words thus re-Persianized in the reading and the system of «camouflage» necessary to hoodwink the Arab conqueror was called «Huzvaresh.» Parallel cases, though not due to the same motive, suggest themselves in English. Thus, we read customarily such words as the Latin *id est,* i.e., as «that is,» or the sterling, the *libra,* as «pound.» Huzvoresh itself meant, quite characteristically, «alteration,» «disguise,» «perversion.» This disguised Persian (which for many years caused modern interpreters much difficulty) was, though, often transliterated into unadulterated Persian, Zend, or Modern Persian, and the Semitic element being wholly removed. Such texts are usually spoken of as Pâzand (meaning «re-explanation») or Parsee. Pehlevī, though, was written and spoken in a form of Persian which had already far advanced on the way to becoming a purely analytical language, grammar and syntax being simplified and declensional and inflectional endings having largely disappeared.

The study of the Pehlevī language was stimulated in 1871 by the discovery of 52 Pehlevi writings in the library of a Parsee high-priest in Bombay. Since then many more inscriptions and manuscripts have been found, and doubtless others are moldering away in the collections of native literati or priests. What has so far been discovered refers in its contents to religious topics, texts on miscellaneous subjects and translations of ancient Zend Avesta texts. Of the Pehlevī literature of between 226 and 881 A.D., the Sassanian period, therefore, and the first two centuries of Arab dominion, there have been preserved nearly 100 works. Chiefly these are the Pehlevī version of the Avesta; the Bundahish, being a species of Iranian Genesis; the Dinkart, i.e., matters of religion; the Dâdistaû-i Dinik, religious discussions; the Mainog-i Khiradj, doctrinal teaching; and the Arda-i Virâf Nâmak, a kind of Apocalypse. Of other Pehlevī literature nothing has been preserved, though indications and internal evidence point to the probability that there must have been quite a stock of it, historical works as well as fiction and lyrics, at the time when the Arabs, in 661 A.D., swept the Sassanide kings out of power. But even during the period of Arab power the Zoroastrian priests continued to write the old tongue as a dead language. The Mâinog-i Khiradj is especially useful to the student of Pehlevī in affording glimpses of the Pehlevī of the earliest period. The rock inscriptions of Ardashir made the great Sassanian ruler of that name the central figure. All these Huzvaresh translations were themselves taken from mere fragments of the Avesta, only one book of which, the Vendidad, having come down to us complete, out of 21. From a philological point of view it is moreover of interest to note the gradual decay of grammatical forms in the slow process of development to which the Persian idiom was subjected and which is clearly noticeable not only in Pehlevī and Modern Persian but even in Old Persian, as distinguished from Zend. The process was, in fact, almost identical in every respect with the process of evolution through which the Romance tongues went in changing from the original Latin tongue, and even from the *lingua rustica.* For comparative philology there is a fund of information to be derived from observing the facts.

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WOLF VON SCHIERBRAND.

PEI-HO, pā-hō', the «North River,» sometimes called PAI-HO, the «White River,» the largest river of northeastern China, draining a watershed of 55,000 square miles; a river of North China, rising in the mountains on the Mongolian frontier of Manchuria, crossing the line of the Great Wall thrice, flowing tortuously to the southeast, receiving the Tunghui 12 miles from the city of Peking, and joining the Sha-ho at Tung-shu, the port of Peking, where it becomes navigable for native boats. Near Tien-tsin the Hu-to-ho empties into the Pei-ho, and from here the river is navigable for small steamers. A little further down the Imperial Canal connects it with the Hoang-ho and the Yang-ste-kiang. The Pei-ho empties into the Gulf of Pe-chi-li, about 350 miles from its source. It is closed by ice from November to March. At its mouth is the fortified town of Taku (q.v.); near the embouchure the Chinese were defeated by the French and English 19 May 1858, repulsed the English 25 June 1859, and were again defeated, the forts being taken, 21 Aug. 1860, by the allies.

PEINE FORTE ET DURE, pān fōrt ā dūr, the name given in Europe to a kind of punishment formerly inflicted upon a prisoner charged with felony if he refused to answer on his indictment. In an indictment for high treason a prisoner who was obstinately mute was liable to receive judgment and execution the same as if he had been convicted. In the lowest felony, or petty larceny, standing mute was also held equivalent to conviction, and the prisoner received sentence and punishment accordingly. But in all other felonies the prisoner was required to plead before a conviction could be obtained, hence if he refused he was subjected to the *peine forte et dure,* «a judgment which was purposely ordained to be exquisitely severe, that by that very means it might rarely be put in execution.» The judgment for standing mute was as follows: That the prisoner be remanded to the prison from whence he came and put into a low, dark chamber, and there be laid on his back on the bare floor, naked, unless where decency forbids; that there be placed upon his body as great a weight of iron as he can bear, and more; that he have no sustenance, save only, on the first day, three morsels of the worst bread; and on the second day three draughts of standing water, that should be nearest to the prison door; and in this situation this should be alternately his daily diet till he answers. The penalty was abolished by George III. There are various cases on record of persons, including at least one female, who have died under the infliction of this penalty. The latest instance recorded of its administration is in 1741. It is said that only once was this penalty inflicted in America and that was in 1692, in the case of Giles Cory, charged with witchcraft, at Salem, Mass.

PEIPUS, pīpoos (Russian, Tchudskoye-Ozero, that is, «Lake of the Tchuds»), a great lake lying about 30 miles south of the Bay of Narva in the Gulf of Finland, bordering the governments of Saint Petersburg, Esthonia, Livonia and Pskoff, and belonging in part to each. It is about 48 miles long and 32 wide and covers an area of 1,020 square miles. It is joined by a broad and very deep passage (about 20 miles wide) to Lake Pskoff, which has an area of about 150 square miles. The entire lake system drains by the River Narova (45 miles) into the Gulf of Finland. The shores of Peipus are low and marshy, and in general heavily wooded, and the water very deep in places. There are several islands; Porka is the largest. Several rivers empty into this inland sea, on which there is a large volume of commerce carried on by steamers. Fishing is an important industry. A naval battle between the Russians and Swedes fought on this lake in 1702 was won by the former.

PEIRCE, pėrs or pērs, **Benjamin**, American mathematician: b. Salem, Mass., 4 April 1809; d. Cambridge, Mass., 6 Oct. 1880. He was graduated from Harvard in 1829, was tutor there in 1831, and in 1833 was appointed professor of mathematics and natural philosophy. In 1842 he accepted the Perkins chair of mathematics and astronomy which he occupied until his death. Harvard gave him the degree of LL.D in 1867. He was consulting astronomer of the ‘American Ephemeris and Nautical Almanac,’ 1849–67; and superintendent of the United States Coast Survey, 1867–74, personally conducting the expedition to Sicily for the purpose of observing the eclipse of the sun in 1870 and organizing various important expeditions. He assisted in the organization of the Dudley Observatory at Albany in 1855, and through his efforts the observatory at Harvard was established. As an astronomer he made valuable investigations and discoveries and as a mathematician his work is of great importance. He was one of the founders of the American Academy of the Arts and Sciences; a member of the American Philosophical Society; and an associate member of the Royal Astronomical Society of London. He was also an honorary member of many foreign intellectual societies. He prepared a series of mathematical textbooks for use in the university which made many departures from the beaten path and which have had a highly beneficial effect upon methods of teaching. His astronomical and mathematical treatises are of great scientific value and include ‘Analytic Mechanics’ (1855); ‘Linear Associative Algebra’ (1870); ‘Ideality in the Physical Sciences’ (1881), etc. Consult King, ‘Benjamin Peirce, a Memorial Collection’ (1881).

PEIRCE, Benjamin Osgood, American educator: b. Beverly, Mass., 11 Feb. 1854; d. 14 Jan. 1914. After leaving school he learned the carpenter's trade but decided to go to college and entered Harvard, where he was graduated in 1876. Upon his graduation he was awarded a traveling fellowship, and went to Germany for four years, receiving in 1879 the degree of Ph.D at the University of Leipzig. On his return to America Dr. Peirce specialized in methematical physics. From 1881 to 1884 he was assistant instructor in mathematics at Harvard, later becoming assistant professor, and in 1888 was appointed to the Hollis chair of mathematics and natural philosophy there. He was a member of the National Academy of Sciences; the American Mathematical Society; the American Physical Society; and the Astronomical and Astrophysical Society of America; and was a Fellow of the American Academy of Arts and Sciences, and also of the American Philosophical Society. He has published ‘Theory of the Newtonian Potential Function’ (1899); ‘Experiments in Magnetism,’ etc.

PEIRCE, Bradford Kinney, American Methodist Episcopal clergyman: b. Royalton, Vt., 1819; d. 1889. In 1841 he was graduated at Wesleyan University and in 1846 became a member of the New England Conference. In 1844–45 he edited the *Sunday-School Messenger* and *Sunday-School Teacher;* in 1854–56 agent of the American Sunday School Union, and in 1855–56 State senator of Massachusetts. From 1856 to 1862 Mr. Peirce was superintendent and chaplain of the State Industrial School at Lancaster, Mass. Subsequently for 10 years he was chaplain of the house of refuge, Randall's Island, N. Y., and for about 16 years edited *Zions Herald*. He published ‘The Bible Scholar's Manual’ (1847); ‘Notes on the Acts’ (1848); ‘The Eminent Dead’ (1851); ‘Question Books for Sunday-School Scholars’ (1849–52); ‘Trials of an Inventor’ (1866); ‘The Word of God Opened’ (1868); ‘A Half Century with Juvenile Delinquents’ (1869).

PEIRCE, Charles Santiago Sanders, American logician and psychologist, son of the great mathematician, Benjamin Pierce (q.v.): b. Cambridge, Mass., 10 Sept. 1839; d. at his home at Milford, Pa., 14 April 1914. He was graduated from Harvard in 1859. He published ‘Photometric Researches’ (1878); and edited, with many additions, ‘Studies in Logic’ by several members of Johns Hopkins University. He was the first to call attention (1878) to the principle of «pragmatism,» and the author of that title. For many years he was connected with the Geodetic Survey as physicist and mathematician. He wrote many memoirs and articles upon logic, psychology, metaphysics mathematics, astronomy, optics, chemistry, engineering and other scientific subjects covering an exceedingly wide range. He also contributed largely to the ‘Century Dictionary’ and Baldwin's ‘Dictionary of Psychology and Philosophy’ (1901).

PEIRCE, George James, American botanist: b. Manila, Philippine Islands, 13 March 1868. In 1890 he was graduated at the Lawrence Scientific School of Harvard and subsequently studied at the universities of Bonn, Leipzig and Munich. In 1895–97 he was assistant professor of botany at Indiana University, in 1897–1900 assistant professor of botany, in 1900–10 associate professor, and since 1910 professor at Leland Stanford Jr. University. In 1909–10 he was collaborator in the United States Forest Service and in 1910–11 was special agent of the Department of Justice, studying the effects of smoke on vegetation. Peirce is a fellow of the American Association for the Advancement of Science and has published ‘Textbook of Plant Physiology’ (1903).

PEIRCE, James Mills, American mathematician: b. Cambridge, Mass., 1834; d. 1906. In 1853 he was graduated at Harvard, where he was appointed assistant professor of mathematics in 1861 and professor in 1869. He became Perkins professor in 1885. From 1890 to 1895 he served as dean of the graduate school and from 1895 to 1898 of the faculty of arts and sciences. He published ‘Textbook of Analytic Geometry’ (1857); ‘Three and Four Place Tables of Logarithmic and Trigonometric Functions’ (1871); ‘The Elements of Logarithms’ (1874); ‘Mathematical Tables, chiefly to Four Figures’ (1879).

PEIXOTO, pā-shō'too, **Floriano,** Brazilian soldier and second President of the Republic of Brazil: b. Pico, province of Alagoas, Brazil, 30 April 1842; d. Rio Janerio, Brazil, 29 June 1895. He entered the army as a private, rose rapidly, gained high honors in the war with Paraguay in 1865–70, and afterward resigned to oversee his estate. The abolition of slavery greatly affected his fortunes and in 1889 he rejoined the army, assisted da Fonseca to overthrow the empire, and was elected a senator of the new republic. He acted as first Minister of Finance, was Vice-President in 1891, and succeeded da Fonseca as President in that year. In the civil war which ensued he firmly upheld the constitution and, though unpopular with the army, crushed the navy uprising under Admirals De Mello and Da Gama, and the second insurrection (1893) in Rio Grande do Sul, and successfully completed his term. Being defeated in the following election by Dr. Moraes, in 1894 he peacefully resigned the office. Consult Luiz Jose Pereira da Silva, ‘Floriano Peixoto’ (Rio Janeiro 1894). See BRAZIL.

PEIXOTO, Ignacio José de Alvarenga, Brazilian jurist and poet: b. Rio Janeiro, 1748; d. Ambaca, Angola, Africa, 22 May 1792. He was graduated from the University of Coimbra, Portugal, as a bachelor of divinity; and received the appointment of judge of Cintra. He returned to Brazil in 1776 and was there appointed judge of the district of Rio das Mortes. As a devoted follower of Paula Freire de Andrade he was implicated in a revolutionary uprising, arrested, imprisoned for two years without trial on the island of Cobras, and on 18 April 1792 was condemned to death. The sentence was commuted to transportation for life and he died a few months later in the penal colony at Ambaca, Africa. His poems, which take high rank in Portuguese literature, were collected and published in Paris, ‘Obras poeticas collegidas annotadas, precedidas de Juizos criticos’ (1866).

PEIXOTTO, piks-ŏt'ō, **Benjamin Franklin,** American diplomat, lawyer and journalist: b. New York, 13 Nov. 1834; d. there, 18 Sept. 1890. Receiving his earliest training in New York, he settled in Cleveland after his father's death, in 1847, studying law for a time under Stephen A. Douglas (q.v.). In 1863 he was chosen head of the Order of Benai Berith, the leading Jewish fraternity, whose membership he rapidly trebled. He advocated an American Jewish University which was not favored at the time, but his suggestion to establish an orphan asylum at Cleveland was adopted. In 1867 he removed to San Francisco where he engaged in the practice of law. In June 1870, when the Rumanian persecution of the Jews reached alarming proportions, he was appointed Consul-General to Bucharest by President Grant, where he succeeded in arresting disorder, with the co-operation of Secretary Hamilton Fish and the active sympathy of the European powers whose representatives in Rumania joined with Peixotto in his work of enlightenment. In addition, he did much educational work among the Rumanian Jews. In 1876 he returned to the United States and was tendered by President Hayes the post of Consul-General at Saint Petersburg, which he declined, accepting, however, the consulship at Lyons, France. In 1885 he returned to New York, resumed the practice of law, established a monthly magazine under the title *The Menorah,* and was prominent in social, educational and charitable work.

PEIXOTTO, Daniel Levy Maduro, American physician: b. in Amsterdam, Holland, 18 July 1800; d. in New York, 13 May 1843. At an early age he came to New York with his parents, his father, Moses L. M. Peixotto, becoming minister of a Jewish congregation. He was graduated from Columbia in 1816 and entering the office of Dr. David Hosack received his M.D. degree in 1819. For a few years he occupied himself with travel, returning to New York in 1823, where he entered upon the practice of his profession, in which he rose to eminence. He became in 1825–26 one of the editors of the New York *Medical and Physical Journal* and *Gregory's Practice.* He was president of the New York County Medical Society 1830–32. In 1836 he was called to the presidency of the Willoughby Medical College, Cleveland, Ohio, and remained there several years. He was an active participant in public charitable work and especially in forwarding Jewish educational movements.

PEIXOTTO, Ernest Clifford, artist and author: b. San Francisco, Cal., 15 Oct. 1869. He began his art studies at the School of Design in San Francisco, and in 1888 went to Paris to continue them at the Académie Julian. In 1890 he exhibited a peasant interior at the Salon and in 1891 a church interior, the latter subsequently exhibited at the Society of American Artists in New York. He returned to San Francisco in 1891. He received honorable mention for some drawings exhibited at the World's Fair, Chicago, 1893, and in that year he returned to France for further study. At the Salon of 1895 he was awarded honorable mention for a picture entitled “A Woman of Rijsoord,” a study of a Dutch woman's head in the quaint coif of the environs of Rotterdam. Returning to San Francisco again, he painted several portraits and had two successful exhibitions. He added to his fame at this period by his artistic illustration in Gellett Burgess' ‘Lark,’ an airy San Francisco publication. He designed most of its covers and made many of its illustrations. In 1897 Mr. Peixotto settled in New York City, and busied himself illustrating for the leading magazines. He illustrated Brun's 'Tales of Languedoc,' Henry Cabot Lodge's 'History of the Revolution,' Theodore Roosevelt's 'Cromwell' and Mrs. Wharton's 'Italian Backgrounds.' As an illustrator his work has taken high rank; its characteristics are simplicity and directness, picturesqueness and vividness of detail. He has always had a fondness for architectural studies, and abroad he made many sketches of the châteaux in the valley of the Loire and of the French cathedrals, while at home his drawings of the Congressional Library in Washington and Boston Public Library are perhaps the best of that class. In 1899 when he again went to Europe he began writing articles to accompany his illustrations of the picturesque out-of-the-way places on the Continent, and since 1906 he has confined his illustrations to his own publications. His first book was 'By Italian Seas' (1906), dealing with Mediterranean material and containing 80 illustrations by himself, followed by 'Through the French Provinces' (1909), with 85 illustrations. In 1906–07 there were two exhibitions in New York of his paintings of old world garden subjects. By special request his drawings and paintings were exhibited in 1907–08 at the Art Institute, Chicago, the Toledo Museum of Art and the Detroit Museum of Art. In 1909 he was made an associate of the National Academy. He then painted a large frieze of panels whose subjects were drawn from the 'Morte d'Arthur' for a library near Cleveland. For this work he was made a member of the National Society of Mural Painters, also of the Architectural League. His pictures have found places in notable private and public collections. His later works are 'Romantic California' (1911); 'Pacific Shores from Panama' (1913); 'Our Hispanic Southwest' (1916).

PEIXOTTO, George Da. M., American portrait and mural painter: b. Cleveland, Ohio, February 1859. He was a son of B. F. Peixotto (q.v.) and on his father's appointment to the Rumanian consulate, he studied at the Dresden Royal Academy of Fine Arts, where he was graduated in 1877, receiving the silver medal. He then went to the Julian Academy in Paris for further study and was also a pupil of Meissonier as well as Munkacsy. His portraits of Cardinal Manning and Sir Moses Montefiore began to arouse attention, and were followed by paintings of Father Sylvester Malone, Chief Justice M. R. Waite, Bishop Gilmour, Chancellor Eliot of Saint Louis and many others. Mr. Corcoran purchased the portrait of Montefiore for his art gallery at Washington. The New Amsterdam Theatre in New York has some of his mural decorative paintings. Mr. Peixotto has contributed to the Paris Salons since 1882.

PEKAN. See FISHER.

PEKIN, pē'kin, Ill., city, county-seat of Tazewell County; on the Illinois River and on the Illinois Central, the Chicago, Peoria and Saint Louis, the Cleveland, Cincinnati, Chicago and Saint Louis, the Atchison, Topeka and Santa Fé, and the Chicago and Alton railroads, about 10 miles south of Peoria. It has steamboat connection with ports on the Illinois River. It was settled in 1824, became a village in 1829, and in 1849 was incorporated as a city. It is in a productive agricultural section in which wheat and corn are the chief products. In the vicinity are coal deposits. The chief manufactures are ammonia, alcohol, beet sugar, glucose, agricultural implements, wagons, carriages, lumber and lumber products, foundry products, fertilizers, brick, tile, organs and furniture. It has an extensive trade in corn and considerable trade in grain, coal and its manufactured goods. There are good public and parish schools, a free library, a beautiful city park, municipal street railway, new $100,000 high school, new $300,000 county courthouse. The city adopted the commission form of government in 1911. Pop. 10,524.

PEKIN DUCK, the largest of the white ducks, weighing in some cases 10 to 12 pounds. It was introduced into the United States from China in 1873. It is hardy, feathers early and grows rapidly. As a market duck it cannot be excelled. It is also profitable as an egg-layer. The bill and feet are yellow or orange, the body long and meaty, the breast has a deep keel, and the flesh an excellent flavor. Ducklings are ready for market in 10 to 12 weeks from hatching.

PEKING, pē-king', or **PEKIN,** pē-kin' (*Pe*, north; *King*, height), the capital of the Chinese empire, in the province of Chi-Li, situated on the Great Northern Plain of China between the rivers Pei-ho and Hoen-ho; lat. 39° 54' 13" N.; long. 116° 28' E. Its population numbers about 700,000. It is about 40 miles from the great wall, 100 miles from the Gulf of Pe-chi-li, and since 1897 has been connected by rail with Tientsin, about 80 miles to the southeast. The entire circuit of the walls and suburbs is reckoned at 21 miles. The wall of the northern section or Tartar City is 50 feet high and 40 feet wide at the top; that of the southern section or Chinese City is 30 feet high and 25 feet thick at the base, diminishing to 12 feet at the top. They are faced nearly throughout with large bricks, laid in a mortar of lime and clay, which, in time, becomes almost as durable as stone. Square towers, projecting 50 feet from the outer side of the walls, occur at intervals of about 60 yards, and the whole is surrounded by a ditch. There are six gates leading from the outer world into the northern city and seven gates into the southern city. Through the wall between the two cities are three gates.

The northern or Tartar City, called Nui-Ching, was built first and the southern, called Wai-Ching, was added later. The former is built in the shape of a parallelogram, the walls facing the four cardinal points of the compass, and consists of three enclosures, one within the other, each surrounded by its own wall. The innermost enclosure or area is called Kin-Ching (prohibited or forbidden city), and contains the imperial palace and buildings connected with it, in which the emperor and royal family formerly resided. It is about two miles in circumference, is surrounded by a solid wall faced with purplish glazed bricks, and roofed with yellow tiles. Within are wonderful gardens, the lakes, the "Island of Everlasting Flowers," and the famous marble bridge.

Within the outer entrance, the «Gate of Celestial Peace,» is the Temple of Imperial Ancestors in a park of fir trees. The inner entrance or «Nobody's Gate» opens into the famous Audience Halls. Within the inner enclosure is the Palace of Celestial Beauty. The second enclosure is of an oblong shape, about six miles in circuit, surrounded by a wall about 20 feet high. It was originally intended for the officers of the court, but is now occupied by Chinese merchants and tradesmen. One of the striking features of the second enclosure, or «Imperial City,» is the terraced artificial mound, 215 feet high, standing close against the northern wall of the «Forbidden City.» It is known as «Coal Hill,» and is now covered with trees. This section also includes the government university and the Northern Cathedral. The third and outermost enclosure comprises the open city, which presents all the evidences of an industrious people intent on the pursuit of gain, mercantile bustle pervading every corner of it. Many of the principal streets are spacious, being more than 100 feet wide. They have been much improved in recent years, being now well drained by deep gutters and metaled in the centre, and kept sprinkled in dry weather. The side streets, however, are, as formerly, foul-smelling beds of mire in the rainy season, and banks of noisome dust when dry. The Legation Quarter which lies along the south wall of the Tartar City is quite modern in its appointments. It is surrounded on the north, east and west by a rampart, and within it are the official residences of the Ambassadors of the United States, Austria-Hungary, Belgium, Great Britain, France, Germany, Holland, Italy, Japan, Russia and Spain. Among the principal public buildings besides those already mentioned are the new (1911) Parliament Building, the Temple of Eternal Peace, belonging to the Llamas, and said to be the largest and most splendid temple in Peking; the Mohammedan mosque; the observatory; the church of Heaven's Lord, with a convent attached to it, considered one of the finest specimens of architecture in the city, but now going to decay. There are also edifices dedicated to several other forms of religion; among these are the Greek and Roman churches, Moslem mosques, Buddhist temples, besides temples dedicated to Confucius and other deified mortals. Among other institutions is the national college, Han-lin-yuen, where all Chinese learning and literature are concentrated, also Manchu, Chinese and Russian; all religions, though some of them are proscribed, share the honor of being sanctioned within its precincts. The chief religions recognized are Confucianism, Taoism and Buddhism. The other learned and scientific institutions of note are the medical college, astronomical board and the imperial observatory. In the northern part of the Tartar City is also the Ketteler Memorial; the Temple of Great Buddha with its wooden statue 78 feet in height; the Temple of Confucius; the Hall of Classics; the Drum Tower; and the Bell Tower with its gigantic bell weighing more than 40 tons. In the Southern City the principal public buildings are the Temple of Heaven and the Temple of Agriculture, both Confucian. In the southwestern section is a noted Buddhist temple. Outside of the walls there are many temples and tombs. The Temple of Celestial Peace is one of these. It was built in the 7th century. To the west of the city is the Taoistic Temple of the White Cloud and to the east the Taoistic Temple of the Eastern Peak, both notable. The old and new Summer Palaces are several miles to the east. Peking is sustained solely by its being the seat of government, having no trade except that which is produced by the wants of its vast population. There are no manufactories of any importance, beyond those necessary for making articles of luxury for the resident aristocracy and gentry. The principal part of the provisions required comes from the southern provinces or from the flocks reared in the northern part of Chi-Li, the adjacent plain producing but a small amount of the food demanded. A considerable portion of the taxes levied upon the productions of the whole empire is paid in kind, and is here stored up; the amount of rice alone in these granaries at one time of the year is enormous; but they are often empty before the new crop is gathered, so that a great many die for want of food.

According to the terms of the Treaty of Tientsin (1858) English and French ministers are allowed to reside at the Chinese capital, and subsequently the same privilege was granted to America and some other nations. Foreigners generally are also allowed to visit the city, but they must be provided with a passport from the ambassador or consul of the nation to which they belong, and on no account is any individual allowed to carry on trade. Previous to the ratification of that treaty, Russia was the only foreign power privileged to have a resident embassy. Besides the old established Roman Catholic missions there are six other Christian missions — four British, one American and one Russian. The Pekingese have more of the Tartar element among them than the inhabitants of any of the more southern cities of China; still the Chinese predominate, and they are gradually superseding their fellow-subjects by their greater industry and wealth. Even the old Tartar Banner corps is being dispersed.

Peking is more healthful than the more southern cities, although the range of temperature is much greater. This arises from the comparative dryness of the site, so that, although the thermometer falls to 4° below zero in the winter, and rises to 104° in the shade in summer, less inconvenience is felt than in Shanghai, where intense humidity prevails at a lesser range. The rainy season is in July and August. In the spring the city is swept by clouds of sand and dust. October is the pleasantest month in the year at Peking. A rude system of drainage intersects the city, but not sufficient to carry off the effluvia of the sewage, which even pervades the dust in summer. Attempts at modern sanitation have been made since 1900, but the progress is slow. The water supply is abundant, and a very complete fire brigade uses it to advantage in quenching the frequent conflagrations that take place. These and other matters are under the management of a governor of the city, irrespective of the central administration, which holds its offices in the imperial quarter of the Tartar section.

Peking is regarded by the Chinese as one of their most ancient cities, dating in Chinese history from 1121 B.C. In 936 A.D. it was captured by the Tartars of the North who destroyed the old city and built a new one. Part of its north wall still remains. In 1151 the Chinese took the city and greatly enlarged it. It was besieged in 1215 and taken by the Mongols, led by Genghis Khan, when the inhabitants for want of ammunition, are said to have discharged ingots of gold and silver on their assailants. Kublai Khan rebuilt it, and made it his capital in 1260. The Mongol dynasty, founded by Kublai Khan, continued to occupy this city till it was expelled from China, in 1367, by Hung-wu, the founder of the Ming dynasty. The name Peking was given to the city in 1409 by the second emperor of the Ming dynasty, who replaced its earth ramparts with brick walls. In 1421, the third emperor of the Chinese dynasty of Ming transferred his residence thither from Nankin, since which it has been the capital of the empire. In 1543 the new wall was built to include the southerly section which had grown up outside of the wall of the Tartar City, and which became known as the Chinese City, after 1644, when the Manchus took possession of the northern city expelling most of the Chinese to the southern section. It surrendered to the allied armies of France and England in 1860, on which occasion the Yueng-ming, or summer palace of the emperor, situated in the vicinity of the city, was destroyed. It was at this period that the various foreign legations were established. During the «Boxer» uprising of 1900 the foreigners in Peking were besieged in the legation section. For weeks they were given up as lost, but they managed to hold out till the arrival of the foreign troops. Since the fall of the Manchu dynasty and the establishment of the republic in February 1912, the class distinctions between the several «cities» have largely disappeared and the people of the several castes intermingle in all parts of the city. Besides the «gateway» smashed through the wall at the time of the siege, another gate has been opened to accommodate traffic, and still another is projected. The railway which formerly was halted at a distance from the city walls has now been brought into the city and a station built near the Gate of Celestial Peace. Two other railways are making progress from Peking over the Great Plain, opening new sections from which the city which produces none of its own supplies may receive the necessaries of life. The «Purple City,» however, still remains closed to visitors except after much official ceremony. See Boxers; China; Peking, The Siege In.

PEKING, The Siege in. The siege in Peking in 1900 was the outgrowth of the Boxer uprising. The latter was a secret society formed at first, for the suppression of lawlessness, under the title of the «Society of the Harmonious Fists;» which name was Anglicized into «Boxer.» This aim was altered later and the Boxers banded themselves together anew for the extermination of foreigners and the prevention of foreign intercourse with China. In 1898 the empress dowager, Tse Hi, by a *coup d'état* made herself the ruling power, holding the young reform emperor, Kwang Hsü, a semi-prisoner. The Dowager represented the reactionary forces of the Empire. The rise of the Boxers against foreigners in 1899–1900 received the encouragement of the Empress Dowager and her coterie who opposed the reforms of Kwang Hsü.

The Boxer movement was not a great anti-religious uprising, nor was it an anti-missionary crusade. It was distinctly anti-foreign, and this, irrespective of race, color, religion or nationality. The Boxers murdered European merchants, killed foreign engineers, massacred British and American missionaries, one and all, for the same reason, namely, that they were foreigners. Native Christians fell under their ban and were put to death by thousands because they were representatives of the new forces that had instituted the reforms of the young Emperor. The feeling against anything and everything foreign ran so high in the city of Peking that native shops were destroyed for selling American cottons or Japanese lamps.

All this time the rumor was spreading that the Empress was lending her aid to the Boxers in the hope that, instituting a reign of terror, all foreigners might be driven out of China. Many Chinese saw in this only disaster to the government, but even members of the Tsung Li Yamen (Foreign Office) were put to death when they opposed this insane policy of exterminating foreigners. This fact, together with documents found in Peking, shows beyond question the complicity of the Chinese government in bombarding the legations. In May 1900 seven of the 11 legations, fearing mob violence, secured from their respective navies detachments of sailors and marines as legation guards. This force reached Peking 31 May. It was less than 500, but in addition, there were probably 450 foreigners in Peking. By June the anti-foreign element was in possession of both the executive and military arms of the Empire. The end of the first week found a critical state of affairs in Peking. The telegraph had been cut, the railroad to the port city of Tientsin had been rendered useless, and all foreigners in and near Peking had fled from their homes and banded together in several places for self-protection. During this time dangers thickened, foreign property was looted and burned, while thousands of native Christians and foreign sympathizers fell by the sword. Matters reached a crisis on the 19th of June when the Chinese government sent word to the legations that all the foreign diplomats and their attachés should leave Peking within 24 hours. This was the beginning of the siege proper. The morning of the 20th, Baron Von Kettler, the German Minister, while on his way to the foreign office to expostulate against this treatment of the representatives of friendly powers, was shot down on the streets of Peking by Imperial soldiers.

Upon the news of the murder of Baron Von Kettler, the other ministers and their nationals who were preparing to leave the city decided that it would be impossible to make a journey of nearly 100 miles through hostile territory infested by bands of Boxers, bandits and Chinese troops. Certain massacre would have followed had the foreigners left the walls of Peking and exposed themselves to the attacks of the Chinese in the open country. Rather than take such a perilous journey, fearing the fate of Baron Von Kettler, the foreigners massed together in the British Legation, and the legations immediately surrounding it, and decided to try to hold out until relief should arrive. Fortunately, the legations in Peking, after Oriental style, were surrounded by strong walls. Withdrawing within this enclosure, supplying themselves with what food they could procure, they fought only on the defensive. Three thousand native Christians went into siege with this handful of foreigners. In round numbers, there were 900 foreigners, including marines, in the legations. Of these, 228 were women and children. In addition, there were the 3,000 native Christians. Besides those in the legations, 41 marines, 13 French fathers, 20 sisters and 3,200 natives were besieged in the North Cathedral. The foresight of Bishop Favier had laid in food for his refugees. Sir Claude McDonald, British Minister, was commander-in-chief of the legation forces. This little band for 56 days held at bay an unknown multitude of Chinese soldiers. Firing was almost continuous upon the legations for 28 days when a semi-truce followed until about four days before the relief forces arrived. The first effort of the Chinese was to set fire to the legations. Dangerous conflagrations were fought day and night until the legations themselves stood in the midst of charred ruins. The great Hanlin Library was fired by the Chinese in an effort to burn the British legation. The besieged had only, besides their rifles, one cannon throwing a one-pound shell, a Nordenfeldt, a faulty Austrian machine gun, a small one-barrel Colt machine gun, and an old English muzzle-loading cannon of 1860.

As many as 400 shells and solid balls were thrown at the legations in a single day. Forty-three days of the siege were marked with the hail of bullets and the crash of shells The Chinese soldiers indulged by night in furious attacks of rifle fire. Major Conger, the American Minister, said that never had he heard during the Civil War a half hour of such fusillades of firing as these night attacks. Only the bad markmanship of the assailants prevented the annihilation of the besieged. Yet every hour witnessed miraculous escapes. From the beginning the siege was well organized. In addition to the military, there were the following committees: (1) general management, (2) fortifications, (3) food supply, (4) labor, (5) fire, (6) confiscated goods, (7) on care of the horses, (8) sanitary and hospital. Constant effort was made by native messengers to reach the port with news. Out of 20 messengers dispatched, 17 were killed — three reached Tientsin. The besieged subsisted on rice, wheat, horses and mules The truce fortunately gave opportunity for replenishing the food supply, in which labors the Japanese soldiers proved themselves most resourceful The native besieged had by that time become so reduced in rations that they ate dogs. Fortunately the wells of water held out. The heat was often great. Smallpox, scarlet fever, diphtheria and dysentery especially, broke out in the native camp, but were held in check Only one foreign infant out of seven survived Marines and civilians vied with each other in the display of bravery. The mortality among officers was large. Captain Thomann (Austrian), Captain Ando (Japanese), Captain Strouts (British), Captain La Bruce (French), Lieutenant Henry (French), Lieutenant Paolini (Italian), were killed. Two British, two American, three Austrian, one Russian, one French and two Italian officers were wounded. The Belgian and American captain-surgeons were wounded and the Japanese surgeon was killed. Among the defenders who took part in the actual fighting more than 50 per cent were killed or wounded. At the cathedral 400 natives and foreigners were killed. The American marines held a perilous position on the city wall, reinforced by British and Russians. Seventeen languages were represented among the besieged.

The Siege of Peking is without a parallel in history. Never before were the representatives of a friendly power brought to such straits by a nation to whom they had been accredited. Diplomats, missionaries, merchants, business men, teachers in the schools, and even an Englishman who was in the capital as a guest of the Chinese government, were penned up in a state of siege and were saved only by the valor of a handful of marines and the personal bravery of some of their own number. Most of the French, the Austrian, Italian, Dutch and Belgian legations were entirely destroyed. All the others, while held, were almost demolished by the terrific bombardment. On 10 June an effort had been made at Tientsin by 2,000 internationals under Admiral Seymour (British) and Captain McCalla (United States) to reach Peking. After getting half way and enduring terrible hardships this force had to retreat to Tientsin. The latter place itself was shelled for 30 days. On 4 August about 20,000 allies under Generals Gaselee (British), Chaffee (United States), Fukushima (Japanese), Linievitch and Vassielevsky (Russian) and Frey (French) left Tientsin and after a terrible march of 10 days reached Peking. Every mile of the way they drove the Chinese forces before them.

The allies attacked the city early the morning of the 14th and the same afternoon at four o'clock, a detachment of Sikhs and Bengal Rajput Infantry under Gaselee and Americans under Chaffee reached the Legations. These were soon followed by the other nationals. A thanksgiving service marked the close of the siege. The *Te Deum Laudamus* was read by the chaplain of the British Legation. At 9 o'clock on the evening of the 14th, the Empress Dowager and the young Emperor with their suites and many of the troops fled by the northern gate of the Tartar City to the mountain fastnesses, 80 miles away. In the confusion the soldiers of the many nations gathered immense quantities of loot which was afterward "sold" at public auctions authorized by the foreign ministers, as the easiest method of settlement.

The siege in Peking adds one more chapter to the conflict between the East and the West. Many of the underlying causes will ever remain obscure. The siege represented what is to be hoped is the final effort of the old China to crush the rising influences of the new. The patience and faith of the women were exemplified under circumstances few have ever had to endure. That the foreigners besieged should ever have escaped is one of the miracles of history. It shows what a small band of men driven to bay can do with few resources and against overwhelming odds.

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PELADAN, pā-lā-dän, **Joséphin** («Le Sar»), French romancer and mystical writer: b. Lyons 1858. He became an eccentric and mystic, took the title of «Sar» (chief), posing as a descendant of the last Babylonian kings, and went about in theatric costume. Among his writings are 'Rembrandt' (1881); 'Introduction à l'Histoire des Peintures' (1884), and a romantic cyclus 'Decadence Latine' (1886–91), a mixture of astrology, mysticism and esotericism, which includes 'Le vice suprême' (1886); 'Curieuse' (1886); 'L'initiation sentimentale' (1887); 'A cœur perdu' (1888); 'Istar' (1888); 'La victoire du mari' (1889); 'Cœur en peine' (1890); 'L'Androgyne' (1890); and 'Le Gynandre' (1891). Apart from this cyclus are 'Femmes honnêtes' (1885); and 'La décadence esthétique' (1888). He was the foundor, in 1892, of the order of La Rose Croix, or Croix du Temple, which, similar to the English pre-Ralphaelite movement several years before, was in reality a reaction against the material side of French art. The cult had great vogue for several years, as the Geste Esthétique salons were held by the Rosicrucians, which promulgated his views and gave lectures and plays written by the Sar Peladan.

PELAGIANISM, pę-lā'ji-ąn-ĭsm, a doctrine in regard to original sin taught by Pelagius, sometimes called Pelagius Brito, a Welsh monk of the latter end of the 4th and beginning of the 5th century, and regarded by the Church after much controversy as a heresy. His name, Morgan, was Latinized into *Marigena* (seaborn), and rendered into Greek as Pelagius (from *pelagos*, sea). He was in Rome about the year 400. He is thought to have imbibed his opinions from the monk, Rufinus, a follower of Origen. Pelagius was a contemporary of Augustine, who was influenced by his opposition to Pelagianism in expounding his own views on the subject. According to Pelagius, Adam was created mortal and would have died had he not sinned; and that his sin was not transmitted to his posterity; that it was possible for man to live altogether without sin; and that grace, that is, the divine aid, was not necessary or even possible to the human will. It was held that the will was free only when influenced neither toward good nor toward evil. Sin then becomes an act and has no existence apart from the act. The act does not change the nature of man, but only exposes him to the penalty. The argument was, therefore, that man was endowed with original perfection, not tainted by original sin. The Pelagians generally affirmed that every child was born in the same state of innocence as Adam was, and that his perseverance in virtue depended upon himself; original sin was an impossibility, since sin was the result of a depraved volition, not an infirmity of nature. A *peccatum naturale*, as they called it, was a confusion of terms, and a contradiction; infant baptism was administered to sanctify and admit children to the kingdom of Heaven, not to remove the stain of sin, because infants had none; unbaptized infants dying in infancy have eternal life; and men may attain Heaven through a righteous life, that is, by keeping the law, as well as through the Gospel, some men having lived without sin while others may. Augustine, opposing these views, maintained that Adam's sin affected the human race, involving all mankind in guilt; physical death is the penalty of sin; infants are baptized for the remission of original or inherited sin, and Jesus Christ was the only sinless man who has appeared upon the earth. Among the Eastern synods the opinions of Pelagius were confirmed as orthodox and Pelagius was advised to anathematize those who opposed him «not as heretics but as fools.»

Between 412 and 431 A.D. 24 councils were held to condemn the Pelagian doctrine. In 416 a synod of western bishops presided over by Augustine declared the Pelagian doctrines heretical. In 418 the civil authorities joined the ecclesiastics in denouncing them. The pope confirmed the sentence of the Third General Council at Ephesus (431) and anathematized the Pelagians. Pelagius was expelled from Jerusalem (421) and found refuge with Nestorius at Constantinople. According to tradition his death occurred in Palestine at the age of about 70 years. Among his writings are works 'On the Trinity'; 'On Free Will'; a 'Commentary on Paul's Epistles' (excepting Hebrews), supposed to exist in an expurgated form among Jerome's works; 'Eulogiæ,' a collection of Scriptural extracts for use as an aid to Christian living; the creed which he submitted to Bishop Zosimus, a letter to Demetrius on asceticism; and various fragments. See Original Sin; Augustine, Saint.

PELAGIANS. See Religious Sects.

PELAGIC. See Terrigenous.

PELAGIC ANIMALS, animals whose life is spent in mid-ocean, either near the surface or at various depths. Some, as the pelagic birds (albatrosses, petrels and the like), may come to shore to make their nests; but many forms are to be found nowhere except in the open sea. They comprise many of the lower forms of animal life, the radiates and mollusks particularly, many of the crustacea and large numbers of fish including some of the sharks and dolphins. The mammals also are represented by the whales. See Deep-sea Exploration; Globigerina; Ooze; Plankton, etc.

PELAGIC SEALING, a term applied to the taking or capturing of seals in the open sea, that is, beyond the three-mile limit. According to the Paris award of 1893, pelagic sealing within a zone of 60 miles of the Pribyloff Islands was forbidden. In 1911, in response to an invitation of the United States, representatives of Great Britain, Russia and Japan met with those of the United States in the International Fur Seal Conference. An agreement was reached that for 15 years no pelagic sealing in Bering Sea should be permitted. This regulation went into effect on 15 Dec. 1911. The agreement was made to apply also to the capture of the sea otter. See Bering Sea Controversy; Fur Trade, The.

PELAGIUS I, pę-lā'jĭ-ŭs, pope: b. Rome; d. there, 3 March 560. He represented Pope

Vigilius at Constantinople, won the favor of the Emperor Justinian, and as the choice of the emperor succeeded Vigilius in the papal chair in 555. Only two bishops and a presbyter assisted in his consecration, and the refusal of many bishops to accept the decrees of the 5th œcumenical council, which Justinian had convened in 555 upon the monophysite controversy, made his pontificate a period of trouble and dissension. The theological tenets concerning which he sustained a controversy with nearly the whole body of the western bishops are known historically as «The Three Chapters.» He endeavored to reform the clergy; and when Rome was besieged by the Goths, he obtained from Totila, their general, many concessions in favor of the citizens. Sixteen of his Epistles are preserved in the *Concilia*.

PELAGIUS II, pope: b. Rome; d. January 590. He succeeded Benedict I, in 579, and was the first independently elected pontiff following the Byzantine conquest of 536. During his term of office a council at Constantinople roused his ire by bestowing upon the patriarch of that city the exalted title of «Universal Bishop.» His most trusted counselor was Gregory the Great, who succeeded him. Ten of his Epistles together with six Decrees are to be found in the *Concilia*.

PELAGIUS, originally **ALVAREZ PAEZ**, celebrated Spanish prelate and ecclesiastical jurist: b. about 1280; d. Seville, 1352. After receiving the degree of doctor at Bologna, where he had studied theology and canon law, he went to Paris to continue his studies under the famous Duns Scotus. His talents and the purity of his life recommended him to John XXII of Portugal, who appointed him grand penitentiary to supervise and remedy the abuses and immorality that prevailed among the clergy. In 1332 Pelagius became bishop of Coron and subsequently bishop of Silves and papal nuncio to Portugal. Among several treatises on theology and canonic law from his pen are 'Summary of Theology'; 'De planctu Ecclesiæ' (2 vols., 1474), a highly esteemed treatise, in which he argues for the limitless spiritual and temporal rights of the papacy and vigorously attacks the disorderly clergy; and also a notable 'Apology of John XXII.'

PELAGONIUS, a Greek veterinary surgeon who lived in the 4th century. Numerous fragments of his writings are found in Greek veterinary collections and in the 'Geoponiques.' A Latin work with an Italian translation, published at Florence in 1826, is entitled 'Pelagonii veterinaria ex Richardiano codice excerpta et a mendis purgata.' It contains numerous formulæ for veterinary remedies, which probably form a collection of different veterinary fragments, but chiefly those of Pelagonius.

PELARGONIC ACID, or **NONONIC ACID**, $CH_3(CH_2)_7COOH$, one of the nonoic acids. A monobasic acid, belonging to the acetic acid series, present in the leaves of the *Pelargonium roseum* and of rue (*Ruta graveolens*) and in the fusel oil from the beet-root. May be prepared in the laboratory by oxidation of oleic acid or of stearolic acid. It is a viscous oil at ordinary temperatures, becoming solid when cooled; boils with decomposition at 490° F. It has a quince-like odor due probably to ethyl pelargonate. This ester is prepared in commercial quantities from the oxidation products of the oil of rue. It is used for improving the flavor of cheap wines and liquors.

PELARGONIUM, a genus of shrubs and shrubby perennial herbs of the family *Geraniaceæ*. About 170 species have been described, mostly natives of South Africa, whence some of them were introduced into European gardens during the latter part of the 17th and early part of the 18th century. Under the popular name geranium some of the species and their innumerable varieties and hybrids have long been popular garden, greenhouse and house plants, because of their fresh green or otherwise colored fragrant leaves, their bright, usually red or white flowers and free blossoming habits and for the ease with which they may be propagated and cultivated. Though the flowers vary little in form, except double varieties, they exhibit great diversity of color, markings and size. And on this account and because of the various markings of the foliage the cultivated species, their hybrids and varieties are arranged for convenience into various groups of which those to be mentioned are the principal. Zonal, horseshoe, bedding, or fish types, popularly known as «geraniums,» which appear to be the progeny of *P. inquinans* and *P zonale*, are popular wherever ornamental plants are grown, but especially in the United States, where they thrive admirably in the hot, dry, sunny climate and probably outnumber any other house and home-garden plant in America. A subdivision of this group has double flowers but is less popular than the single-flowered forms because of their unkempt appearance. Ivy-leaved «geraniums» are derived from *P. peltatum*, a species which is said to have appeared in Great Britain in 1701. The plants are rather scraggly, but are popular for window-boxes, hanging-baskets and such things. The thick leaves are conspicuously angled, the flowers usually pink, often double and of pleasing tints. Rose «geraniums» are derived from various species; for instance, *P. radula* and *P. graveolens*. These are grown for their scented foliage. *P. odoratissimum*, the nutmeg geranium, belongs to this group.

The fancy types which gardeners call «pelargoniums,» or Lady Washington geraniums, are less grown in America than in Europe, where they have an immense number of varieties and figure prominently not only in flower shows but in home gardens. The hot American summers seem to be against them; but they are somewhat cultivated in greenhouses. The species from which the group is derived are not definitely determined but *P. cucullatum*, *P. angulosum* and *P. grandiflorum* are all thought to be blended more or less. There are also several species which are cultivated under their specific names but none are as popular as the above.

As a rule the plants are propagated by means of cuttings rooted under glass during spring and potted in good loam. When the weather has become settled in the spring the plants are removed to the garden where they are allowed to remain until danger of frost when they are dug up, such cuttings taken as are needed and the plants potted for winter bloom or for stock. They may be stored in straw or hung from the ceiling of a dry cellar until wanted. Some of the kinds must be more carefully managed; but the common, popular ones can be «mismanaged» more satisfactorily than probably any other plant.

PELASGIAN ARCHITECTURE, an arbitrary title given by some writers of Cyclopean Works (q.v.).

PELASGIANS, pe̦-lăs'jĭ-a̦nz, a legendary Indo-Germanic race which in prehistoric times was spread over Greece, Asia Minor and Italy. It has been held by some writers that the name does not represent a distinct race, but is merely an epithet, like *autochthones* or *aborigines*. Acusilaus (6th century B.C.) included under the title Pelasgia all Greece as far as Larisa and Pharsalia.

The Pelasgi are mentioned by Homer as dwelling in Argos and in Epirus; by Hesiod with Dodona as their seat. Herodotus says that Greece was anciently called Pelasgia and he includes as Pelasgians the Athenians, Arcadians, Ionians of Asia Minor, the Lemnians, the Samothracians and the inhabitants of Creston. He also speaks of them as worshipping all the gods at Dodona without giving a name to any. It is Arcadian tradition that Pelasgus was the first man to live in Arcadia and that during his time that country was known as Pelasgia. Strabo speaks of the Pelasgians as formerly spread over the whole of Hellas but particularly among the Æolians. There are also accounts of their inhabiting Bœotia and Attica. Herodotus mentions their non-migratory habits. Various accounts are given of their expulsion from Athens. Thucydides refers to Pelasgic as a word common among the Greek tribes before the use of the term Hellenic. Herodotus also says it was thus applied among the Athenians. They are mentioned by various writers from Homer downward as occupying islands in the Ægean. Herodotus enumerates 17 islands on the coast of Asia as belonging to them. They inhabited in his time the cities of Scylace and Placie on the Propontis and spoke a language different from Greek. Euripides says that all Greek traditions agree that Peloponnesus in the earliest times was called Pelasgia and that its inhabitants were known as Pelasgians.

Italian accounts of the Pelasgi are vague and difficult to reconcile. The Pelasgi are supposed here to have given to the Latin language the element it had in common with the Greek. Bishop Thirlwall interprets the reference of Herodotus to the language of the Pelasgians as signifying that they spoke a language differing from Greek as a remote but cognate branch of the same stock. Grote holds that Herodotus meant that the language they spoke was not Greek at all.

Niebuhr regarded the migrations of the Pelasgians as mythical, while he held that they inhabited all the countries from the Po to the Bosporus and supplying a common foundation to the Greek and Latin languages. The supposed Pelasgian migrations are, he believed, only the scattered fragments of this once united people, whose greatness he places in prehistoric times. Other writers, such as Grote, receive the entire tradition of the Pelasgians with skepticism. Remains attributed to the Pelasgi are found in Italy, Greece and Asia Minor, but their diffusion is held to be at variance with the notion of their being the works of a single people, to such a degree as to form an independent testimony to the otherwise doubtful existence of a race by whom they might have been executed. These remains belong to the style of architecture called Cyclopean. See Cyclopean Works.

An exhaustive discussion of the traditions and historical references concerning the Pelasgians, with the conclusion that they were not mythical, is to be found in Wm. Ridgeway's 'Early Age of Greece' (Cambridge 1901). Consult also Hall, H. R. H., 'The Oldest Civilization of Greece' (London 1901) and 'Ægean Archæology' (London 1915).

PELAYO, pā-lā'yō, a historical personage of the royal line of the Visigoths, who is considered the first Christian king of Spain, following its conquest by the Arabs. He appears to have withstood the Arabs in the mountain districts of Asturias (q.v.) in which the Christians of Spain had taken refuge, His death is recorded as occurring in 737. The genealogy of the reigning family of Spain is traced back to Pelayo.

PELECYPODA, pĕl-ĕ-sĭp'ŏ-da̦, or **LAMELLIBRANCHIATA**, the class of aquatic *Mollusca* known popularly as «the bivalves» and which are distinguished externally by the possession of shells in two measurably symmetrical parts or «valves.» They include the clams, oysters, scallops, cockles, mussels, the pearl oyster, teredos or shipworms, and similar forms. They range in size from the tiniest up to the prodigious *Tridacna gigas* of the Pacific, with a shell three feet across.

The pelecypoda number about 11,000 species which are classified in five orders. About one-fifth of these are fresh-water forms. Fossil remains of about 15,000 species have been recognized. See Bivalves; Mollusca, and the names of various groups and species. Consult Pratt, H. S., 'Manual of the Common Invertebrate Animals' (Chicago 1916).

PELÉE, Mont, mŏnt pē'lē (Fr. mŏṅ pā-lā), Martinique, West Indies, an active volcano in the northwestern part of the island, noted for its eruptions in 1902, that of 8 May destroying the town of Saint Pierre (q.v.), and nearly 30,000 people, and that of 30 August destroying Morne Rouge, Ajoupa-Bouillon, and other localities, with a loss of about 2,500 persons. Previously recorded eruptions were those of 1762 and 1851. Prior to 1902 the mountain was characterized as a lofty, solitary peak about 4,600 feet high with gradual slopes. Its crater was about one and a half miles in circumference and had a depth of from 1,000 to 2,000 feet below the level of the crater rim. On the southwest side the crater rim was breached to the base by a great gash which continued into the gorge of the Rivière Blanche; over 20 other ravines and waterways indented the mountain slopes. Within the great crater lay L'Etang Sec, a small crater lake. Since the eruptions of 1902 the crater has increased in width toward the east, south and southwest, the tuff walls on the east and south are almost if not quite vertical, while the V-shaped gash in the southwestern rim is wider and the southern side of it has been cut away and is now filled by volcanic débris. Over 180 feet of the summit was blown away, and the crateral basin L'Etang Sec disappeared, but from it an enormous obelisk of polished rock with a basal thickness of 300 to 350 feet extruded to a height of 1,600 feet or more, towering above the lowest portion of the present crater rim 475 feet, and giving Mont Pelée a varying altitude of from 5,100 to 5,140 feet as the extrusion continued and fragments broke away from its summit. (See MARTINIQUE). Consult Heilprin, 'Mont Pelée and the Tragedy of Martinique' (1903).

PÉLÉE (pē'lē) **ISLAND,** an island in Lake Erie lying 10 miles off the southwestern coast of the province of Ontario, Canada, southwest of Point Pélée. It is a part of Essex County, Ontario. It is nine miles long, from north to south, and from three to four miles wide. It is the most southerly land of the Dominion of Canada, lying in lat. 42° N., on the same parallel as the city of Boston, and of Rome, in Italy. Its chief product is grapes and tobacco is grown there successfully. It also has some timber land and the sand on the shores is in special local favor for building.

PELEG ARKWRIGHT, a pseudonym used by David Law Proudfit (q.v.) for a series of newspaper contributions, written partly in dialect. Achieving success with these he began writing under his own name.

PELEIDES, in Greek mythology, a son of Peleus. See ACHILLES.

PELEUS, pē'lūs or pē'lē-us, in Greek legends, the son of Æacus king of the Myrmidons of Thessaly. He is said to have married the sea-nymph Thetis, and thus the father of Achilles (q.v.). Tradition relates that he took part in the expedition of the Argonauts.

PELEW (pĕ-loo') **ISLANDS,** a group of 26 small islands in the Pacific between lat. 7° and 8° N. and long. 134° and 135° E. They lie west of the Caroline group, and are sometimes considered a part of this group; area, 190 square miles. They were discovered in 1543 by Ruy Lopez de Villalobos, who called them the Arrecifos. Six of them are inhabited; the largest island is Babelthuat, in the northern part of the group, 24 miles long. The islands are hilly, heavily wooded, and completely surrounded by coral reefs. The soil is fertile, and sugar, bread-fruit, tobacco, bananas, oranges and other tropical fruits are raised. Tortoise shells and mother of pearl are also obtained. The people are the Micronesian race and are ruled by a king who resides on the island of Korror. They are a primitive people and have a number of interesting social customs which make them an important subject of ethnological study. These islands were taken possession of by Spaniards in 1545 and were held by Spain until 1899 when they were sold to Germany with the Caroline and Marianne Islands (except Guam). In October 1914, with the latter mentioned groups of islands, the Pelew Islands were seized by the Japanese fleet, remaining in their control until the end of the war, when the mandatory administration of the islands was assigned to Japan by the Peace Treaty of May 1919. Pop. 5,500.

PELHAM, pĕl'ạm, **Peter, English mezzotintengraver:** b. England about 1684; d. Boston, Mass., December 1751. Data concerning his early life is not obtainable, but he was probably born at Chichester and some authorities fix the date of his birth about 1694. The earliest date found on any of his plates is 1720. In 1726 he came to Boston, where he established a school in which reading, writing, dancing and needlework were taught, and he gave lessons in drawing and painting, at the same time continuing his engraving. He was the earliest artist resident in New England and his portrait of Rev. Cotton Mather (1727) was the first mezzotint engraving produced in America. He was stepfather to John Singleton Copley (q.v.) and his first instructor in art. Among his subjects are George I; Queen Anne, after Kneller; Oliver Cromwell, after Walker; Rev. John Moorehead (1731) and Rev. Mather Byles, after his own originals; Rev. Benjamin Colman (1734); Rev. Wm. Cooper and Rev. Joseph Sewall, after Smibert; Governor Shirley (1747); Rev. Edward Holyoke and Thomas Hollis, after Highmore (1749).

PELHAM, or THE ADVENTURES OF A GENTLEMAN, a novel by Bulwer-Lytton, appeared anonymously in 1828. It was the writer's second published novel, following «Falkland,» and the first work of his that gave promise of his extraordinary ability.

PELHAM-HOLLES, Thomas, 1st Duke of Newcastle. See NEWCASTLE, THOMAS PELHAM-HOLLES, 1ST DUKE OF.

PELIAS, pē'lĭ-ạs, in Greek mythology, the son of Poseidon (Neptune) and Tyro. He drove his younger stepbrother Æson, son of Tyro and Crethens, from the throne of Iolcus. He was killed and his body dismembered and boiled, by his own daughters at the instance of Medea who promised them that in this way he could be restored to youth. According to another form of the myth Medea killed him.

PELICAN, a web-footed bird of large size, weighing up to 16 pounds, of the genus *Pelecanus*, order *Steganopodes*. The pelicans form a distinct family (*Pelecanidæ*) easily distinguished by the great membranous pouch which is attached to the throat and hangs from the rami of the long lower mandible. The upper mandible is straight, 14 to 18 inches long and sharply hooked at the end. Pelicans range in size from four to six feet in length, with a wing expanse of eight to nine feet, the wings bearing numerous quillfeathers, and having great powers of flight. As in some related birds the pneumatic system is wonderfully developed, extensions of the anterior air-sacs passing beneath the skin and there developing into an extensive area of subcutaneous air-cells. Ten species of pelicans are known which inhabit most tropical and temperate parts of the world, and fossil remains of nine other species show their existence as far back as the Lower Miocene (in France). Of the living species, three are American. Two of these are maritime inhabiting the coasts of the Southern States. The other, the white pelican, frequents only fresh water in the summer, nesting far to the north, but in the winter goes to salt water districts in the South. The American white pelican (*P. erythrorhynchos*) is abundant along the Gulf Coast and, in the interior, in the Mississippi Valley and westward, far into Canada, and is common on the coast of California; elsewhere in temperate North America it is rare. With the exception of the black primary wing-quills and neighboring parts, the plumage is entirely white, often with straw color on the breast. In the spring the beak of the male develops midway of its length a rough horny crest which reaches its greatest dimensions (three inches) in the breeding period, and is subsequently molted. This species often lives in great communities, especially during the breeding season. The only nest is a rude heap of earth and trash, on which a single egg with a thick, chalky, white shell is deposited. The young are hatched naked but are soon covered with a growth of white down, and later with a heavy plumage. The flight is easy, graceful and sustained; and the bird is fond of rising to great heights and soaring evidently for pleasure. When feeding they skim the surface of the water or dive beneath it, and scoop up small fishes in the net-like pouch, and, after draining the water off, swallow them. The white pelican is often seen in long lines beating the water with their wings and so driving the fish into shoal water where they are easily captured. The young are fed on fish regurgitated from the crop, and not upon living fish carried in the pouch. Unlike the white pelican, which frequents the shores of lakes and rivers, as well as the sea, the brown pelican (*P. occidentalis*) is strictly maritime on the Atlantic Coast of tropical and subtropical America. The general color is mottled silvery gray and brown, the top of the head being white, and there is no crest on the beak. In feeding this species plunges on its prey from a height of 20 feet above the water, thus differing from other pelicans. Two or three eggs are laid in a coarse nest of sticks placed on the ground. The general habits resemble those of the white pelican. The California pelican (*P. californicus*) is the representative on the Pacific Coast of the brown pelican, which it closely resembles. Its head and neck are white, the general color being silvery gray streaked with brown. It is found from the Galapagos Islands as far north as British Columbia. In Europe are found a white pelican (*P. onocrotalus*) lacking the rostral crest, and a larger and rarer species (*P. crispus*). Other species of similar habits occur in Australia, Asia and Africa.

The pelican is the Hebrew Kâath, and from the fact of its resorting to the most lonely places it is used in the prophecies and psalms as an emblem of solitude and desolation. Popular fancy has ascribed the red tip at the end of its beak to blood drawn from its own breast for the nourishment of its young; hence in ecclesiastical symbolism it represents the church feeding her children with her life. Thus the pelican early found a place in Christian art, and like the fish and the peacock has been emblazoned in windows and mosaics, carved in stone and wood, and enameled in crimson and white on chalices and sacred vessels. Its highest symbolic significance was reached when it was used as an emblem of Christ whose blood was poured out for mankind. There are traces of this symbolism in the litanies and hymns of the ancient church, as well as the creations of art. Consult Twining, 'Symbols and Emblems of Christian Art' (1886); also, Bailey, F. M., 'Handbook of Birds of the Western United States' (Boston 1914); Chapman, F. M., 'Birds of Eastern North America' (New York 1916).

PELICAN, The. See ARGUS AND PELICAN.

PELICAN-FISH, a fanciful name given to the deep-sea fishes of the family *Eurypharyngidæ* (specifically *Eurypharynx pelecanoides*), representing a distinct order Lyomeri, the gulpers. There are four genera, *Saccopharynx, Eurypharynx, Macropharynx* and *Gastrostomus,* each represented by a single species. These rare fishes have an eel-like body, reaching at least six feet in length, four-fifths of which is tail, and an extraordinary structure probably derived from some eel-like ancestor. They are, however, of a distinctly lower physical type, the muscles being feebly and loosely developed and the bones, especially of the head, very soft and elastic. They have an enormous development of the jaws and the throat and stomach are capable of great distension suggesting the pouch of a pelican. They are believed to feed on the minute animal life in the deep sea, taking in great mouthfuls of water and straining out the animalculæ through their long fringe-like teeth. It is not uncommon for some of these creatures to swallow a fish as large or larger than itself. The attempts of the *saccopharynx* to exceed even that limit were for a time our only knowledge of its family, the few specimens known being those found floating dead with a fish in the pouch too large to be disposed of. Specimens of all four of the genera named have been secured by dredges at depths varying from 2,350 feet to 8,800 feet. Consult Goode and Bean, 'Oceanic Ichthyology' (1895). See DEEP-SEA EXPLORATION.

PELICAN ISLAND, (1) an island, now a bird reserve, off the east coast of Florida, in Indian River, so called because brown pelicans breed there. It has an area at high water of about five and one-half acres. Desiring to prevent the extinction of the birds, the Audubon Society tried to gain possession of it, but failed to accomplish their purpose on account of the large amount of litigation involved. In 1903 the United States government took possession and the Secretary of Agriculture established a bird reserve there, to guard against the total extinction of the pelicans. The reserve was enlarged in 1909, by order of President Roosevelt. The island is very low, and when a storm or very high tide occurs at nesting time, hundreds of the young birds are drowned. (2) An island in Lake Winnipeg, about latitude 52° 20′ N. The principal meridian of Canada passes just to the west of the island. It belongs to the province of Manitoba. (3) An island in Princess Charlotte Bay off the northeast coast of Australia, in latitude 13° 50′ S.

PELICAN STATE, a popular name for the State of Louisiana.

PELICAN'S FOOT, a small mollusk, (*Aporrhaïs pes-pelecani*) a native of Europe, one of the four living species of the genus *Aporrhaïs.* The species *A. occidentalis,* found off the northern coasts of the United States is the only American representative. This shell gets its name from the arrangement of the spiny protuberances extending from the outer lip, suggesting the webbed foot of the pelican. The characteristic form of the shell is only attained in the adult period, the young shell being destitute of spines. Though only about two inches in length, the pelican's foot is an article of food in Southern Europe.

PELION, pē'lĭ-ŏn, Greece, now Mount Plessidi. See OSSA.

PELISSIER, pā-lē-sē-ā, **Jean Jacques Aimable**, Duke of Malakoff, marshal of France: b. Maromme, near Rouen, 6 Nov. 1794; d. Algeria, 22 May 1864. Educated at the military school at Saint Cyr, he entered the army in 1815 as sublieutenant of artillery. In 1819 he became a staff officer, subsequently serving in Spain in 1823, in the Morea in 1828–29 and in Algeria in 1830. In this country, being then a colonel, in 1845 he suffocated in a cave a whole tribe, numbering some 600 Arabs, who had taken refuge in it, by lighting a fire at the mouth, an atrocity which aroused great indignation; but Bugeaud, commander-in-chief, declared that Pelissier had only obeyed positive orders. He was made a general of brigade in 1850 and a general of division in 1855, and was placed in command of the forces operating at Sebastopol. On the capture of the Malakoff and the fall of Sebastopol he was appointed marshal of France and made Duke of Malakoff. In 1856 Sir Hugh Gough, the field marshal of Great Britain, was sent to the Crimea to invest Marshal Pelissier with the insignia of the Order of the Bath. He was afterward vice-president of the senate, a privy-councilor and Ambassador to England (1858), and in 1859 was made Grand Chancellor of the Legion of Honor. In 1860 he was appointed governor-general of Algeria.

PELL, John, English clergyman and mathematician: b. Southwick, Sussex, 1 March 1611; d. London, 12 Dec. 1685. Educated at Cambridge, he became professor of mathematics at Amsterdam in 1643 and in 1646 at Breda, where he was also professor of philosophy. From 1654 to 1658 he was the agent of Cromwell to the Protestant cantons of Switzerland. In 1661 he took orders in the English Church and was rector of Fobbing and vicar of Laindon, Sussex, till his death, but was more notable for his mathematical attainments than in his clerical labors. Through his publication in 1668 of a solution (not his own) in his algebra of the equation $y^2 = ax^2 + 1$, this particular expression received the distinguishing title, «Pell's equation.» To him is frequently attributed the invention of the symbol of division ÷ but the credit of this is in reality due to Rahn, whose work, which Brancher had translated, was edited by Pell in 1668. Among his works are 'Astronomical History of Observation of Heavenly Motions and Appearances' (1634); 'Ecliptica Prognostica' (1634); 'Controversy on the Quadrature of the Circle' (1646); 'An Idea of the Mathematics' (1650); 'A Table of Ten Thousand Square Numbers.' In addition to these published works he left a great mass of manuscripts and letters, many of them on mathematical subjects, and 40 large folio volumes, filled with them, are preserved in the British Museum. In his old age he was reduced to extreme poverty, and when he died he received private burial only through the charity of former acquaintances.

PELLA, (1) a city of ancient Macedonia on a marshy lake formed by the river Ludias: a royal city in the 5th century, when it was Archelaus' capital, it was remodeled by Philip II, who removed his capital here from Edessa. It was the birthplace of Alexander the Great, the site of a splendid castle adorned with paintings by Zeuxis and of a cenotaph of Aristotle, and in Roman times was the central military station for the province. It is identified with the modern Palatitza, where excavations of importance (described in Hauzey and Daumet, 'Mission archéologique en Macédoine' (1876) have been made. A funeral *stele* of great artistic interest belonging to the late 5th century or the early 4th century B.C. is preserved in the Imperial Museum at Constantinople. (2) An ancient and important city of Palestine, east of the Jordan, famous as the refuge of the Christians of Jerusalem when that city was taken by the Romans (67 A.D.), and identified with Tabakat Fahil. It was taken by Antiochus the Great in 218 B.C., and was later destroyed by the Jews under Alexander Jannæus. After being rebuilt it was captured by Pompey, who restored it to its original inhabitants. Portions of the wall are still standing, and the famous fountain mentioned by ancient writers remains unchanged to identify the locality.

PELLA, Iowa, city in Marion County, on the Chicago, Rock Island and Pacific Railroad, 45 miles southeast of Des Moines. Central Baptist College is located here and there are a public library, canning and pickle factory, feeder works, flouring mills, brick and tile works, wagon works, furniture factory, tank and pipe works, etc. The municipality owns the water-supply system and the electric-lighting plant. Pop. 3,021, mostly of Dutch descent.

PELLAGRA, a disease, or complication of diseases, discussed in Italy under this name in the 18th century and which since that time has been rapidly increasing. It is common in northern Italy, in the south of France, in Spain and in countries further east in southern Europe. Within recent years it has been found extensively in the United States, particularly in the Southern States. It more frequently begins with an erysipelatous eruption on the skin, which breaks out in the spring, continues till the autumn and disappears in the winter, chiefly affecting those parts of the surface which are habitually exposed. The disease is accompanied or preceded by remarkable lassitude, melancholy, moroseness, hypochondriasis and not seldom by suicidal tendencies. With its progress and duration the disorder becomes more aggravated, with shorter and shorter intervals in the winter. At length the surface ceases to clear itself and becomes permanently enveloped in a thick, livid, leprous crust, somewhat resembling the dried and black skin of a fish. By this time the physical resistance is reduced to a very low ebb and not seldom the mental functions as well. The victim loses the use of his limbs, especially of the legs, suffers with violent colic, headache, nausea, flatulence and heartburn, the appetite being variable. The countenance becomes void of expression. There is a sense of burning heat in the head and along the spine, where it radiates to other parts, especially to the palms and soles, tormenting the victim day and night. To these severe afflictions are often added strange hallucinations. The disease, when advanced, takes the form of many other maladies, such as tetanus, convulsions, epilepsy, dropsy, mania and marasmus, the patient being at last reduced to the appearance of a mummy. It is mainly confined to the poor residing in the country districts and is seldom seen in very young children.

The cause of this disease has been ascribed to the eating of corn, in which a putrefaction occurs during the warm season. Just what food factor is wanting is not yet certainly known. Consult Marie, A., 'Pellagra' (1910), and *Reports,* United States Marine Hospital Service.

PELLATT, pĕl'ăt, Sir **Henry Mill,** Canadian capitalist: b. Toronto, 1860. He was educated at Upper Canada College and joined the staff of the brokers' firm of Pellatt and Osler at the age of 15; later he was taken into partnership by his father. He is president of the Toronto Electric Light Company, of the Electrical Development Company of Ontario, Ltd., of the British and Colonial Land and Securities Company and of the British-Canadian Dock and Shipbuilding Company, and director in very many industrial corporations. In 1901 he received the command of the Queen's Own Rifles and the command of the Canadian contingent at the coronation of King Edward. In 1910 he took a contingent of the Rifles to England for army manœuvres. In 1912 he was made brigadier of the 6th Infantry brigade.

PELLÉAS (pĕl-lā'ąz) **AND MÉLISANDE** mā'lì-sän'd'. To understand Maurice Maeterlinck's 'Pelléas et Mélisande,' one must have some knowledge of this dramatist's theory of dramatic technique. The style of his early small dramas consisted of iteration of phrase and elision of thought. They dealt with the unseeable forces of destiny and resorted to external accessories, like storms, meteors, mysterious lights and felt presences — characteristic of certain morbid romances, but going beyond the conventional romance by the added grace of an inner mystic beauty.

Then there befell a change of attitude in Maeterlinck toward the theatre; his dialogue became less shadowy and more representative of definite character. This change was partly due to the fact that he discovered for himself the shortcomings of his theory, and that philosophically he had advanced out of the murkiness of the «Cymbalist» school into the light of health and a sound will, through the influence of Georgette Leblanc, whom he married about this time. This explanation is necessary in order to understand why 'Pelléas et Mélisande' is so mystic and «misty.» Maeterlinck here used, as a basis for his play, the story of Francesca and Paolo, so appealingly stated by Dante in the famous 14 lines in «The Inferno.» It is a simple love story, told in half-uttered phrases, in which impulsive and faintly developed youth and wise old age flit across the horizon at moments when Nature announces the descent of destiny on willess characters.

The play was printed in Brussels in 1892 and was first played at the Théâtre des Bouffes-Parisiens, with Lugné-Poë as Golaud and Mme. Marie Aubry as Pelléas. It was used as the libretto for an opera by Claude Debussy, an exponent of the «new» school of music in France, and was produced at the Opéra-Comique in Paris 30 April 1902. A storm of protest followed this *première,* for the score was unmelodic and filled with dissonance. There was likewise some ill feeling due to the fact that the composer wished Miss Mary Garden, rather than Madame Maeterlinck, to appear as Mélisande. The opera was first heard in America at the New York Manhattan Opera House, under the direction of Oscar Hammerstein, 19 Feb. 1908, with the original Parisian cast. As a play 'Pelléas et Mélisande' received notable presentation when, in June 1898, Mrs. Patrick Campbell appeared as Mélisande, Forbes Robertson as Golaud and Martin Harvey as Pelléas. Later, in America, Mrs. Campbell appeared with Madame Bernhardt, who played Pelléas. 'Pelléas et Mélisande' was one of the pieces selected by Madame Maeterlinck for outdoor performance at the Maeterlinck château of Sainte-Wandrille. A sympathetic English translation of this play was made by the late Richard Hovey.

Montrose J. Moses.

PELLEGRIN, pĕl'-grăṅ, the pseudonym of the Baron de la Motte-Fouqué. See Fouqué, Friedrich Heinrich Karl, Baron de la Motte-Fouqué.

PELLEGRINI, pĕl-lā-grē'nē, **Carlo,** English caricaturist: b. Capua, Italy, March 1839; d. London, England, 22 Jan. 1889. He was descended from the de Medicis on his mother's side. He received a good education, but soon dissipated the fortune inherited from his father. He entered Garibaldi's army and fought at Volturno and Capua; and went to England in 1864, where he began his career as a caricaturist. His humorous drawings of men in public life, beginning with Disraeli and numbering several hundred, were published in *Vanity Fair* over the signature of «Ape» from January 1869 until his death, and won for him a national reputation. He also achieved some eminence as a sculptor and painted some portraits which were exhibited at the Royal Academy and the Grosvenor Gallery. Among his intimates at one time he was affectionately called «Pelican.»

PELLEGRINI, Pellegrino. See Tibaldi Pellegrino di Bologna.

PELLETIER, pĕl-tē-ā, Sir **Charles Alphonse Pantaléon,** Canadian statesman: b. Rivière Ouelle, province of Quebec, 22 Jan. 1837. He was graduated from Laval University in 1858, studied law and was admitted to the bar in 1860, becoming queen's counsel in 1879. He sat in the Dominion Parliament for Kamouraska, 1867–77, was Minister of Agriculture, 1877–78, was made speaker of the senate in 1896, having been a member of that body from 1877, and was knighted in 1898.

PELLEW, pĕl'oo, **Edward,** British admiral. See Exmouth, Viscount.

PELLEW, pĕl'oo, **Henry Edward,** American social reformer: b. Canterbury, England, 26 April 1828. In 1853 he was graduated at Trinity College, Cambridge, and received his M.A. at Oxford in 1870. He was one of the founders of Keble College, Oxford, and was on the executive boards of Feltham Industrial School and other institutions, and identified with various London hospitals and charities. In 1873 he came to the United States, organized the Bureau of Charities in New York in association with the late Theodore Roosevelt, and was active in organizing night refuges, a free circulating library, coffee houses, the first tenement-house reform movement and the erection of improved dwellings. Since 1888 he has resided in Washington, D. C., where he is interested in work among the negroes, in the formation of the Washington Protestant Episcopal diocese and in aiding the building of the Washington cathedral.

PELLICO, pĕl'lē-kō, **Silvio,** Italian poet and dramatist: b. Saluzzo, Piedmont, 24 June 1788; d. Turin, 1 Feb. 1854. At the age of 16 he went to Lyons, France, where he remained a few years and on his return became a private tutor. In 1810 he became an instructor in the French language in an institution at Milan. In 1818 he joined Romagnosi Manzoni and others in establishing *Il Conciliatore,* a literary journal in the patriotic interest, which was suppressed by Austria after a two years' publication (1818–20). He was arrested in 1820 as a member of the Carbonari, and on 21 Feb. 1822 was finally condemned to death. The emperor, however, commuted the sentence to an imprisonment for 15 years in the citadel of Brünn, Moravia. He was released in 1830 and went to live at Turin. His health had been broken by his suffering, however, and his record of his experiences, ‹Le Mie Prigioni› (‹My Prisons,› 1832), made him, says Garnett, «as typical a figure as the Iron Mask or the Prisoner of Chillon.» It was soon translated into many languages; there is an English version by Roscoe (1833). Pellico's lyric verse is indifferent, and but one of his tragedies, ‹Francesca da Rimini› (1818), has remained famous, although ‹Laodicea› was highly esteemed in its time. Of this there is a rendering into English by Bingham (1897; ‹Italian Gem› series). Consult *The Foreign Quarterly Review,* April and October, 1833; Longfellow, ‹The Poets and Poetry of Europe› (1845); Giuria, ‹Silvio Pellico e il Suo Tempo› (1854).

PELLITORY, or **SPANISH CAMOMILE,** a plant (*Anacyclus pyrethrum*) closely related to and resembling chamomile (q.v.) of the same order and belonging to an allied genus. The flowers are considerably larger, and are less numerous than those of camomile. It is a native of the Levant and of southern Europe. The root has a hot, pungent taste, derived from a fixed resinous matter, which stimulates the salivary glands, and excites a glowing heat in the mouth. A genus of plants (*Parietaria*) of the nettle family is known as wall-pellitory. The common wall-pellitory (*P. officinalis*) is a herbaceous perennial, which contains nitre, and was formerly used as a diuretic.

PELOPIDAS, pĕ-lŏp'ĭ-dạs, Theban general and statesman: d. Cynoscephalæ, Thessaly, 364 B.C. He was a son of Hippoclus, inherited great wealth, and was an intimate friend of Epaminondas. In 382 the Spartan leader Leontiades seized the Cadmeia, the Theban citadel, and Pelopidas was driven into exile at Athens. He returned in 379 with a small band, and in a surprise attack at night, which has become classic, recovered the Cadmeia, overthrew the Spartans and with his own hand slew Leontiades. A democratic government was formed and Pelopidas became its leading general. He won the battle of Tegyra against the Spartans in 375, and aided Epaminondas to defeat the Lacedemonians at Leuctra in 371, making Thebes for a time the ruling power of Greece. In 368 Pelopidas headed the expedition against Alexander of Pheræ and was treacherously taken prisoner, but was liberated by Epaminondas and was sent on an embassy to the Persian court, where great success attended him. In 364 he again moved against Alexander and defeated the latter's forces at Cynoscephalæ, but was slain during an impetuous pursuit of his fleeing enemy. Consult Plutarch, ‹Life of Pelopidas.›

PELOPONNESIAN WAR, the internecine and intermittent contest, hardly to be dignified by the term war, between Sparta and Athens for the hegemony of Greece 431–404 B.C. The aristocratic party in Athens, after the second Persian Invasion in 480, had in general under the leadership of Aristides and Cimon aimed to effect a cordial understanding with all the Greek states and especially with Sparta, leaving her leadership unquestioned. But the democratic leaders of Athens' golden age, coming into power in 460, changed all this, recognized the natural contrariety of the interests of the two states, built up the city's navy, strengthened the Peiræus, formed an Ionic league, which soon proved a mere means of money getting for the expenses of the growing navy, and provoked the struggle. In 435 Athens as ally of Corcyra assisted that city when Corinth undertook to protect Epidamnus, a Doric colony, against Corcyra; and immediately Corinth summoned the aid of Sparta. In 431 when Thebes, a city of central Greece, but a bitter enemy of Athens, opened the war by attacking Platæa, Athens was supreme at sea, Sparta on land; Athens had a widely scattered and weakly bound empire. Sparta's was massed in the Peloponnese, with important outposts at Athens' very door, and Athens represented Ionic democracy, Sparta, Doric oligarchy. The result was that the war became not a mere conflict between two leagues, but a manifold civil war, the democratic party in each siding with Athens, the oligarchy with Sparta, and each ready to massacre the other. As for the two principal actors in the struggle — Athens attempted by sea to devastate the coasts of the Peloponnese, and Sparta striking by land laid waste the state of Attica with the exception of the city of Athens and its long walls reaching down to the sea. In 429 Pericles, the able Athenian leader, died of the plague that ravaged the city, and two years later Athens captured Mytilene, and the Spartans and Thebans took Platæa, the most bloody outrages taking place in each conquered town. In 425 Athens seemed utterly successful; she fomented a rising in Corcyra which annihilated the pro-Spartan aristocrats; and she captured an entire Spartan garrison on the island of Corcyra — a terrible blow to an army whose motto was «Death or victory.» Sparta sued for peace, but Cleon and the other demagogues of Athens refused. The operations in Thrace against Athens' possessions there were carried on brilliantly by Brasidas, but at Amphipolis in 422 both he and Cleon were killed. Nicias (q.v.), an aristocrat and a Conservative, took the place of prominence held by Cleon at Athens and negotiated in March 421 a 50-year truce, which unfortunately did not bind the Spartan allies, and even in Athens was soon disregarded owing to the growing influence of Alcibiades (q.v.). In 420 he formed a league between Athens, Mantinea, Argos and Elis; then planned to bring about the defeat of Sparta in the Peloponnese by means of Argos — a scheme crushed by the Spartan victory over the Argives at Mantinea (418). The unfortunate Sicilian expedition (415–13) might have succeeded had not Alcibiades been forced out of command and into the enemies' camp. As it was, it struck at Athenian maritime prestige and practically finished the war. The eight years before the actual end were marked by sudden renewed vigor on the part of Athens due to the recall of Alcibiades in 411; his victories at Abydus and Cyzicus in 408 were the last that Athens won. Then Sparta with the unlimited wealth of Cyrus as backing gained the lucky victory of Ægospotami (405), Athens was taken, and the long walls were razed (404). The story of the war is told by Thucydides (q.v.), the first great philosophical historian, whose incomplete narration is supplemented by Xenophon's 'Hellenica.' Consult the authorities under GREECE, *History*.

PELOPONNESUS, pĕl-ō-pŏ-nē'sŭs, or **PELOPONNESE** (Greek, «Pelops' Island»), the ancient name for southern Greece, the large peninsula now known as the Morea, because its outline resembles that of a mulberry leaf. It is an individual mountainous system of more than 8,300 square miles, reaching at its apex an elevation of 7,875 feet. It is attached to the mainland by the slender isthmus of Corinth, which has the Corinthian Gulf on the west and the Saronic Gulf on the east. The chief divisions of the country in ancient times were Arcadia, in the centre, Achaia, to the north, Elis, to the west, Messenia, to the southwest, Laconia, to the southeast, and Argolis, to the northeast. There was never much trade in the Peloponnese; its people were farmers and herdsmen. At one period it was notorious for its roaming bodies of brigands. Patræ (q.v.) was the only port of importance. It contained the cities of Mycenæ, Sicyon, Tiryns, Corinth, Argos, Trœzen, Epidaurus, Sparta. Pylos, Methone, Elis, Ægium, Tegea, Mantinea and Megalopolis. Consult Clarke, 'Peloponnesus, Notes of Study and Travel' (1858); Beulé, 'Etudes sur le Peloponnèse' (1875); Curtius, 'Peloponnesos' (Gotha 1851–52); Leake, 'Travels in the Morea' (London 1830); and 'Peloponnesiaca' (ib. 1846); and Philippson, 'Der Peloponnes' (Berlin 1892); Blonet, 'Expédition scientifique du Morée' (Paris 1838). See GREECE.

PELOPS, pē'lŏps, a legendary personage appearing in Greek mythology, as the son of Tantalus, king of Lydia, and the grandson of Zeus. He became a suitor of the beautiful Hippodama, and by defeating her father Œnomaus, king of Pisa, in a chariot race, through the treacherous connivance of Myrtilus, the king's charioteer, obtained the bride with a kingdom. Myrtilus had been won over by an offer of half the kingdom; but Pelops, being unwilling to keep faith with him, threw him from a cliff into the sea. The drowning man cursed his murderer, and to this curse was attributed all the misfortunes that fell upon the house of Pelops. Peloponnesus received its name from him. Of his sons, Atreus and Thyestes are most celebrated. After death Pelops received divine honors, and a temple was built to him in the grove at Olympia, in which was the Pelopium where sacrifices to him were offered. His memory was further perpetuated in sculptures on the east pediment of Olympia. History records his name as the leader in the Achæan invasion, 1300 B.C.; and attributes to him the restoration of the Olympian games.

PELORIA, *in botany*, the appearance of regularity of structure in the flowers of plants which normally bear irregular flowers, instances of which occur in the snap-dragon and the toadflax, which being normally irregular, assume a symmetrical form. It seems to be the result of abnormal conditions, especially as concerns light.

PELOTA, pä-lō'tạ, or **JAI-ALAI**, a Spanish ball game popular in Cuba, South and Central America, and latterly in certain parts of the United States. It is played both indoors and out; but requires a court or concrete floor, 200 feet long and 65 feet wide, with a front wall 36 feet square at one end and a second or rebounding wall of similar dimensions at the other end of the court. The game is played with a ball, about the size of a lawn tennis-ball and a long, narrow, curved wicker work basket or *chistera* fastened to the hand by means of a glove. The players number four, six or eight, divided equally into sides or teams. In the professional game there are three players on a side. The ball is bounded from basket to wall and must always be kept in motion. The game is usually of 50 points. What cricket is to England, football and baseball are to the United States, lacrosse and hockey are to Canada, pelota is to Spain and other Spanish-speaking countries. It is claimed for this game that it requires a better eye, more speed, activity and surer control over every muscle of the body than any other sport.

PELOTAS, pä-lō'täs, Brazil, city and most southerly port of the state of Rio Grande do Sul, 25 miles northwest of the city of Rio Grande, on the left bank of the São Gonçalo River. The bar of the embouching river has been cleared away and Pelotas has become one of the most important of Brazilian ports because of its fine harbor. The São Gonçalo makes commercial relations with Uruguay possible. While the commercial section of the city is not always inviting, the residential quarter and the suburbs are attractive. Its chief industry is drying and powdering meat; there are great abattoirs near the city and 600,000 cattle or more are killed each year. Pop. about 33,000. There are many Europeans, especially Germans and Italians, in the city. The port serves also a considerable part of Uruguay, and its chief exports are the hides of cattle and horses, and a quantity of maté, or Paraguay tea. The imports are chiefly coal, iron and steel, both raw and manufactured, cotton goods, china, glass and earthenware, flour, paper, machinery and firebrick.

PELOUBET, pĕl'oo-bĕt, **Francis Nathan**, American author: b. New York City, 2 Dec. 1831. In 1853 he was graduated at Williams

College and in 1857 at the Bangor Theological Seminary and in the same year entered the Congregational ministry. From 1857 to 1883 he held various pastorates in Massachusetts, after which he has devoted himself to religious literary work. His published works include 'Select Notes on the International Sunday School Lessons' (44 annual vols., 1875–1918); three grades of Sunday School Quarterlies for the Scholars, 1880–1919; 'Suggestive Illustrations on Matthew, John and Acts' (3 vols., 1898–99); 'Loom of Life' (1900); 'The Teacher's Commentary on Matthew and on Acts' (1901); 'Front Line of the Sunday School Movement' (1904); 'Studies in the Book of Job' (1906); and various articles on the Sunday School. He edited 'Select Songs for the Sunday School' (Vol. I, 1884; II, 1893); 'Revision of the Oxford University Bible Helps'; 'The Cyclopedic Concordance' (1903); a second revised edition of Smith's 'Bible Dictionary'; 'The International Bible Dictionary' (1912); 'Treasury of Biblical Information' (1913); 'Oriental Light' (1914).

PELTIER EFFECT, a phenomenon of cooling, or the apparent absorption of heat, observed by J. C. A. Peltier at the junction of two rods of metal, when a current is made to pass through both in the same direction as the current which heats them. It is well known (see THERMO-ELECTRICITY) that heat is transformed into electricity in a thermo-electric circuit. The electric current in passing through all parts of the circuit tends to heat the conductors, so that it would seem as if the current merely carried heat from the thermo-electric junction to other parts of the circuit, effecting an equalization of temperature. The heat is transformed into electricity not only at the hot junction, but also, as Lord Kelvin has shown, at portions which have different temperatures of one or both metals. Peltier discovered that a current flowing in a circuit composed of two metallic conductors heated one junction and cooled the other, and it came to be supposed that, as in a thermo-electric circuit, the currents hitherto observed had cooled the hot and heated the cold junction in the manner observed by Peltier, the heat producing the current was wholly absorbed at the hot junction, and given out at the cold junction, diminished by radiation, and by the heat equivalent of the work done in the rest of the circuit. It has been shown by Lord Kelvin that this explanation is incomplete. When the temperature of the junction is at the "neutral point" (see THERMO-ELECTRICITY) the two metals are thermo-electrically identical, and no Peltier effect can occur, yet a current passes through a circuit when the hot junction is at the neutral point and the other is not, and therefore there must be absorption of heat somewhere else in the circuit than at the junctions. It has been proved that in a copper wire a current carries heat with it from a hot place to a cold one; whereas in an iron wire a current carries heat with it from the cold places to the hot ones, thus retarding equalization of temperature throughout the circuit. See ELECTRIC DIRECT CURRENT.

PELUSIUM, pē-lū'shĭ-ŭm, ancient city of Egypt, situated at the northeastern extremity of the delta of the Nile, and giving its name, which in Greek meant "mud city," to the eastern or Pelusiac mouth of the Nile at Tineh, 40 miles to the north. The city of Pelusium is probably to be identified with Sin of the Bible. It was the scene of several battles, notably the defeat of Sennacherib's besieging forces owing to the fact that the night before the battle a host of field-mice made their way into the Assyrian camp and gnawed through the bowstrings; and the victory of Cambyses in 525 B.C. which put an end to the Egyptian Empire. Pelusium is celebrated as being the birthplace of the geographer Ptolemæus. All that remains of the city at the present day is a few mounds and fragments of broken columns.

PELVIC GIRDLE. See PELVIS.

PELVIS (Latin, "basin"), the bony basin formed by the haunch-bones and sacrum of vertebrates, which constitutes the arch giving support to the lower or hinder limbs. The pelvis corresponds to the shoulder-girdle of the upper or fore limbs, and forms a cavity in which several of the abdominal viscera, and organs relating to reproduction and the urinary functions, are contained and protected. The human pelvis is formed on the sides and in front by two bones, each of which is known as an os innominatum. This, the chief bone of the pelvis, although consisting of but a single bone in the adult, is in the young state composed of three distinct bones, the ilium, ischium and pubes. These bones unite firmly about the 25th year of life to form a deep cup-shaped cavity, the cotyloid cavity or acetabulum, which receives the head of the femur or thigh-bone, and thus forms the hip-joint. To this cup the ischium and ilium each contribute two-fifths of its extent, the pubes making up the remaining one-fifth. The acetabulum shows on its lower surface a depression, to which the interarticular ligament of the hip-joint is fixed. From the acetabulum the ilium rises backward and upward, and constitutes the haunch, and thus forms the chief upper boundary of the pelvic basin. The ischium passes backward and downward from the acetabulum, while the pubis proceeds inward and forward, and joins its fellow of the opposite side to form the front wall of the pelvis. Behind, the innominate bones articulate with the sacrum — composed of several vertebræ united together in one bone — which thus forms the posterior part of the pelvis. The sacrum and coccyx belong to the spinal column. The sacrum is an irregular pyramid in shape, apex downward and jointing with the coccyx.

The pelvis is inclined in the erect attitude of man so that the plane of its brim forms with the horizontal plane an angle of from 60 degrees to 65 degrees, raising the base or upper part of the sacrum about four inches above the front. The pelvis of man differs materially from that of woman, the differences having chiefly reference to the greater capacity required for the purposes of gestation. The ilia in woman are more expanded than in man, giving to the female her noticeably greater breadth, on the average about two inches, across the hips. The pelvis of woman, as a whole, is also of lighter weight than that of man. Complicated muscular attachments exist in connection with the attachment of the pelvis to the trunk, and with that of the lower limbs to the pelvis. Deformities of the pelvis arise from various causes, error in development, local disease, injury, new growth, etc. There are racial peculiarities in the shape of the pelvic brim. That of the Caucasian is wide transversely, while that of the negro is relatively constricted in the same sense. The study of the shape and size of the pelvis is of especial interest to obstetricians.

The pelvis varies greatly in development and perfection even in the *Mammalia*. It may be extremely rudimentary, as in whales, dugongs and manatees. In the *Mammalia* generally the pelvis is always more elongated and narrower than in man. It is much elongated in bats and insectivorous mammals; its halves being connected at the pubis by ligament only, or being, as in many bats and in moles and shrews, wholly unconnected and separate in front. In no birds, save in the ostriches, are the pelvic halves united at the symphysis pubis. In all birds, and in the porcupine ant-eater, the acetabulum is perforated. The *Monotremata* and *Marsupialia* possess what are termed marsupial bones, attached to the front of the pelvis brim or pubes. (See MAMMALS; MARSUPIALIA; MONOTREMATA). These bones are merely the ossified inner tendons of the external oblique muscles of the abdomen, which in kangaroos, etc., support the marsupium or pouch. The ischia are the most constantly represented elements in the mammalian pelvis. In turtles and crocodiles the disposition of the pelvis resembles that of man. In some snakes (for example, boas, pythons, etc.) a rudimentary pelvis exists. In all amphibians the ilium is invariably represented in the pelvis, and an ischium in all except *Proteus*. In fishes many variations exist in the degree of perfection of the pelvic elements. The ilium of fishes is almost invariably absent.

Pelvic Girdle.— In man this part of the skeleton (imperfect behind, the gap being filled by the sacrum) is formed by the two innominate bone — the haunch or hip bones. In the lower forms of animal life its construction is various. See ANATOMY; OSTEOLOGY, and consult Dorman, Franklin A., 'Deformities of the Pelvis' (New York 1916).

PELZ, pělts, **Paul Johannes**, American architect: b. Seitendorf, Silesia, 18 Nov. 1841. He was educated at the College Saint Elizabeth and the College of the Holy Spirit, Breslau; at 16 removed to America whither his father had come in 1851 for political reasons. In 1859–66 he studied architecture at New York under Detlif Lienau. For many years he was connected with the United States lighthouse board as architect and civil engineer, and designed many lighthouses. He was architect of the Congressional Library building, of Georgetown College Academic Building, Carnegie Library and Music Hall Building, Allegheny, Pa., the United States Government Army and Navy Hospital at Hot Springs, Ark., the Chamberlain Hotel, Old Point Comfort, Va., Clinic Hospital, University of Virginia, Aula Christi at Chautauqua, N. Y., Machinery Hall at the Saint Louis Exposition, and many others.

PEMBA, a coralline island lying 20 miles due east of the port of Tanga, German East Africa and about 28 miles northeast of Zanzibar. It is a part of British East Africa under the division of the Zanzibar Protectorate. It is about 38 miles long, 10 miles broad and has an area of about 400 square miles. It is generally low with some inland hills and swampy valleys, and is well-wooded and fertile. The northern and eastern parts were until recently covered with primeval forests, which have been partly cut away for clove plantations. The Arabs call it "The Emerald Isle." The shore line of the island is deeply indented so that no part of it is far from the sea, and this serves to temper the very hot climate with continual breezes. The rainfall is about 75 inches. Malaria of a mild type is prevalent, otherwise the island is salubrious.

Pemba is notable as being the largest clove growing district in the world, having 38,000 acres under cultivation, and producing an annual crop of about 9,000,000 pounds — about 70 per cent of the world's supply — valued at nearly $2,000,000. This industry is practically all in the hands of Arabs. There are also some cocoanut groves, but the soil is too clayey to suit them, and the climate is too moist for drying the copra. A few ceara rubber plantations have been set out, and the forests abound in the rubber vine (*Landolphia*), but the rubber production is so far insignificant. All sorts of tropical fruits grow in abundance. There were formerly great rice fields, and rice was the chief food of the inhabitants and the chief article of export. Now the principal food is the manioc or cassava (tapioca), and rice is one of the chief imports. The island is governed from Zanzibar, with which it has wireless communication, and a weekly steamer service. Chake-chake (pop. 9,000), the principal seaport and town, stands on an inlet on the west coast. Pemba was transferred to the British East Africa Company in 1891 by the Sultan of Zanzibar. The capital is Weti, on the west coast, situated on the islet-fringed Bay of Weti. Pop. about 83,130. Consult Craster, J. E. E., 'Pemba, the Spice Island of Zanzibar' (London 1913); Lyne, R. N., 'Zanzibar in Contemporaneous Times' (London 1905).

PEMBERTON, pĕm'bĕr-tŏn, **John Clifford**, American soldier: b. Philadelphia, Pa., 10 Aug. 1818; d. Penllyn, Pa., 13 July 1881. He was graduated from West Point in 1837, served against the Indians in Florida in 1837–39, and took part in the settlement of the Canadian border troubles, 1840–42. He was made first lieutenant in 1842 and served under General Worth in the Mexican War, being breveted captain for conspicuous bravery at Monterey, and major for services at Molino del Rey. He continued in service in the army accompanying the expedition to Utah in 1858. At the outbreak of the Civil War he resigned his commission and entered the Confederate army. He was appointed lieutenant-colonel and engaged in organizing the artillery and cavalry of the State of Virginia in which task he was eminently successful. He was made a major in 1861, and a few weeks later was promoted to colonel, and then to brigadier-general. In February 1862 he was promoted to the rank of major-general with command of the department of South Carolina, Georgia and Florida; in October of the same year he was raised to the rank of lieutenant-general; in 1863 succeeded General Van Dorn in the department comprising Mississippi, Tennessee and eastern Louisiana. Here he refused co-operation with General Johnston's plans and his correspondence with that general fell into the hands of General Grant, who defeated him at Champion's Hill and Big Black Bridge, and later captured Vicksburg after a brave defense by Pemberton. His conduct excited severe criticism and after his exchange he resigned his commission, but in 1864 accepted the rank of lieutenant-colonel with command of the artillery defenses at Richmond and served until the end of the war. The remainder of his life was spent in retirement in Virginia and later in Pennsylvania.

PEMBERTON, Max, English novelist: b. Birmingham, England, 19 June 1863. He was educated at Cambridge and was one of the staff of *Vanity Fair* in 1885. He was editor of *Chums*, a boys' paper, 1892–93, and editor of *Cassell's Magazine*, 1896–1906. He has published ‘The Dairy of a Scoundrel’ (1891); ‘The Iron Pirate’ (1894); ‘Sea Wolves’ (1894), and ‘The Impregnable City’ (1895), stories of adventure; ‘The Little Huguenot’; ‘A Puritan's Wife’ (1896); ‘Gentleman's Gentleman’ (1896); ‘Christine of the Hills’ (1897), a novel of Dalmatian life; ‘The Garden of Swords’ (1899); ‘The House Under the Sea’ (1902); ‘Doctor Xavier’ (1903); ‘A daughter of the States’ (1904); ‘The Gold Wolf’ (1904); ‘The Hundred Days’ (1905); ‘Signors of the Night’ (1905); ‘Sir Richard Escombe’ (1908); ‘White Motley’ (1911); ‘War and the Woman’ (1912); ‘Behind the Curtain’ (1916); ‘Her Wedding Night’ (1917).

PEMBROKE, pĕm'brŭk, Canada, town and county-seat of Renfrew County, Ontario, situated on the Ottawa River and reached by the Canadian Pacific and the Grand Trunk railroads, 100 miles north by west of Ottawa. It has several fine public buildings and contains two hospitals, woolen mills, lumber and saw mills, steel mills, building materials works, tool works, leather and leather goods works, brick yards, etc. Pembroke was once the residence of the Rev. Henry Edward Letang, the French-Canadian churchman. Pop. 5,626.

PEMBROKE, N. H., town in Merrimack County, on the Merrimack River, and the Boston and Maine Railroad, five miles south of Concord. Pembroke Academy is located here and the town also contains a soldiers' monument, monument to Josie Langmaid and a sanitarium. It has extensive interests in farming, poultry-culture, and cotton manufacturing. Pop. 3,062.

PEMBROKE, (1) Wales, a western maritime county or shire of South Wales bordered by Saint George's channel on the northwest and the Bristol channel on the south, and bounded northeast by Cardigan and east by Carmarthen. Area, 614 square miles. Capital, Pembroke. The county is diversified with hill and vale, attaining a height of 1,754 feet in the Precelly Hills; the coast is indented by numerous bays and fine harbors, chief of which is the celebrated Milford Haven (q.v.). Barley, oats and potatoes are the principal agricultural products; coal is mined and slate quarried; iron and lead mining have practically ceased. The fishing industry is important. Pop. about 90,000. (2) The capital of Pembroke County, Wales, on the estuary known as Milford Haven, 40 miles west of Swansea, and 270 miles by rail west of London. Its principal industries are connected with Pembroke Dock, or Pater, two and one-half miles northwest, a naval dockyard and arsenal, established in 1814. This establishment comprises an area of 80 acres, and since 1861 has been fortified at a cost of more than $2,500,000. Pembroke's most interesting edifice is its ruined Norman castle dating from 1094, in which it is said Henry VII was born in 1457. Pop. about 15,600. (3) The capital of Renfrew County, Ontario, Canada, on a southern point of Allumette Lake, an expansion of the Ottawa River, 74 miles by rail northwest of Ottawa on the Canadian Pacific and Canadian Atlantic railways. It is the see of a Roman Catholic diocese. The Muskrat River, a small affluent of the Ottawa, traverses the town and supplies water-power to the saw, grist, woolen mills, the tannery and other industrial establishments. The town has nine churches, six schools, two hospitals and three banks. It is supplied with cheap hydro-electric power from its own works, and manufactures for export mocassins, gloves, steel furniture, etc. A considerable trade in lumber is carried on. Pop. about 8,500. (4) A municipality of Leinster, Ireland, suburban to Dublin, on the southeast.

PEMBROKE (pĕm'brōk) **COLLEGE**, Cambridge, England, was founded in 1347, under the name of Valence-Mary, by Mary de Saint Paul, widow of Aylmer de Valence, Earl of Pembroke, who was killed on his wedding-day at a tilting match held in honor of the bride; she thereupon went into conventual retirement, bequeathing her estate to pious uses. King Henry VI was so liberal a benefactor to the college as to obtain the name of a second founder. There are 29 open scholarships, varying in value from $100 to $400 a year, and 13 open fellowships. The buildings were greatly added to and altered between the years 1870 and 1883, many of the original structures being torn down and rebuilt. The chapel, in Corinthian style, was built by Sir Christopher Wren in 1663. Among many noted alumni are Nicholas Ridley, the martyr, Archbishops Grindal and Whitgift, Spenser and Gray, the poets, and William Pitt (the younger).

PEMBROKE COLLEGE, Oxford, England, originally Broadgates Hall, was founded in the year 1624 by James I, and obtained its name from William Herbert, Earl of Pembroke, then chancellor of the university. It was endowed by the Rev. Richard Wightwick, rector of Ilsey, Berks, and by Thomas Tesdale of Glympton, Oxfordshire. The present constitution of the college, settled by ordinances of the commissioners under the statute of 1877, admits of a master, not less than 10 fellows, and of not less than 12 scholars. Some of the fellowships are at present suspended. There are in all 24 scholarships and exhibitions the value of each being from $300 to $500 a year. Among its distinguished alumni are Beaumont, the dramatist, Camden, the antiquary, Sir William Blackstone, Sir Thomas Browne, Samuel Johnson, John Pym, Shenstone and George Whitefield.

PEMMICAN, a food preparation of the American Indians, consisting of buffalo or venison meat, cut into strips and dried in the sun, and, after being pounded into powder mixed with fat to a paste, and pressed into cakes. It was mixed with shad-berries, cranberries or other wild fruits and compressed in bags of rawhide. It was chiefly used on long journeys and time of war. A similar preparation made of beef under the same name is used on long Arctic expeditions, the fruit used being raisins or Zante currants. It is regarded as containing the largest possible food value for the space it occupies.

PEMPHIGUS, pĕm'fĭ-gŭs, or **POMPHOLYX**, known popularly as «bladdery fever,» an affection of the skin characterized by an eruption of large vesicles ranging in size from that of a pea to a walnut, filled with serous fluid, blood or pus, and called blebs or bullæ. The disease assumes both acute and chronic forms, and appears also as a concomitant with other diseases, as syphilis. In mild acute cases blebs appear in succession, continue for several days, then break, form a thin scab, and soon heal without fever or inflammation. In severe cases there is often much constitutional disturbance, the blebs are larger, and the scabs heal with difficulty. The general health shows impairment, fever develops, and sometimes there is troublesome itching. The chronic form differs from the acute mainly by its longer continuance. The acute chiefly affects children, and has been ascribed to dentition, errors of diet, etc.; while the chronic chiefly attacks aged persons, and is probably due to debility and impaired nutrition. The acute form usually requires only cooling medicines and diet, and mild local dressings, such as simple cerate, to protect the raw surfaces from exposure to the air. In the chronic form a nutritious diet, with the judicious use of tonics (iron, strychnine, quinine, etc.), is most commonly successful. In obstinate cases arsenic is given. Sedative local applications and continuous baths in warm water are of great importance in the treatment.

PEN, an instrument for writing with a fluid. Pens have been in use from very ancient times, being made and adapted to the material upon which the written characters were to be impressed. In the earliest periods tools of steel served for writing on stone or metallic plates, and such are referred to by Job in speaking of an «iron pen.» For the waxen tablets of the ancients a metallic stylus was employed, one end of which was sharpened for marking, and the other was flattened for erasing the marks and smoothing the wax, hence the phrase «often turn the pen,» which was used in careful revision, with frequent erasure and rewriting. It was also the practice in ancient times, as among the Chinese at the present day, to paint the letters with a fine hair pencil. Pens of reeds were also made at a very early period for the use of a fluid ink upon papyrus. The reed selected for this purpose is described as small and hard, and about the size of a swan's quill. It was found in Egypt and Armenia; and Cairo and Alexandria were famous markets in which it was sold. Along the shores of the Persian Gulf reeds are still collected for this use, and are distributed throughout various parts of the eastern countries, being better adapted to the ink and paper employed in these regions than any other kind of pens. They are prepared by leaving them under dung heaps for several months which causes them to acquire a mixed black and yellow color, and a smooth and hard surface. The pith is dried up by the heat generated.

Quill Pens.— The introduction of paper rendered necessary pens of finer character, and quills of the goose and swan next came into use, and for extremely fine writing those of other birds, as of the crow, were found well adapted. A great trade grew up in these articles, and continued for several centuries. Poland and Russia were largely engaged in it, and immense flocks of geese were raised in those countries chiefly for their quills. In a single year Saint Petersburg has furnished to England over 27,000,000 quills. Germany and the Netherlands were also large producers of goose quills. From each goose the average number of good quills obtained was only 10 or 12, though sometimes they amounted to 20. As they were plucked from the wing they were soft and tough, and covered within and without with a thin membrane. They were first sorted according to the length and thickness of the barrel into primes, seconds and pinions, and were then buried for a short time in hot sand which dried the outside skin, so that it was easily scraped off, and the inner lining became shriveled and detached. This treatment was called, from having been practised in Holland, «dutching.» After this the quills were hardened by dipping them into a boiling solution of alum or of diluted nitric acid, which also rendered the barrel yellow. A portion of the barbs was then stripped off, and the quills were tied in bundles for the market.

Steel Pens.— The immense consumption of quills led to the invention of the steel pens, which appeared first in England in 1803. They cost originally $2 to $3 each, although the price was reduced to 12 cents in the course of 10 years. No substantial advance was made in the manufacture until after the adoption of drop presses, in 1825. It was not till after 1830 that steel pens began to come into extensive use, owing to improvements introduced by James Perry, Joseph Gillott, Sir Josiah Mason and other manufacturers. The lowest-priced pens are now made almost entirely by machinery, but the finer qualities require a deal of hand labor in finishing. Up to quite recent years all the steel for the manufacture of pens was imported from Sheffield, England, and for certain makes of pens the steel is still brought from there. But American steel makers have been very successful in supplying a satisfactory 1 per cent carbon steel which answers every purpose, and the importations are very small. As it comes to the pen manufacturer the steel is in sheets about five feet long, 19 inches wide, and 23/1000 of an inch thick. This is cut into strips 19 inches long and just wide enough to cut a double row of pens, with their points interlapping alternately. The strips are first annealed for several hours, and then placed in a tumbling barrel containing a «pickle» of dilute sulphuric acid to remove the scale of oxide. The strip is then cold-rolled by successive reductions to a thickness of 9/1000 of an inch — requiring about 20 passes through the rolls. For some special pens the thickness required is but 2/1000 of an inch. The sheets are most carefully gauged, the maximum variation permitted being 1/4000 of an inch. The strips are passed into the hands of a girl, seated at a press, who, by means of a die and punch corresponding, cuts out pieces the shape of the pen, called blanks at the rate of 40,000 per day of eight hours, some 200 different styles of dies being required to produce the variety demanded by the market. The next stage is called piercing, which is cutting out by a punch the central hole in the nib, and at this stage also the lateral slits are cut. The metal has become through the repeated rolling and stamping so hard that it is necessary to anneal it. This is effected by placing the blanks in cast-iron pots, and raising them to a red heat in a muffle-furnace, afterward leaving them to cool slowly. Up to this stage the blank is a flat piece of steel; it is now stamped with the maker's name and the number, and is then passed to the raising-press, where it is rendered concave by being pressed into a groove by a sinker. The next process is hardening, which is done by heating the pens to a red heat in an iron box or muffle, and then plunging them in oil. The process of tempering follows; and then they are scoured and cleaned by immersion in soda water and dilute sulphuric acid successively, and by friction in a tumbling barrel with sand and similar solid substances. The outside of the nib is then ground first lengthwise and then crosswise, which is done by different persons upon separate emery grinding-wheels. Next comes the most delicate operation, cutting the central slit, upon the nicety of which a great part of the value of the pen depends. The pen is placed lengthwise on a chisel fixed in the bed of a shearing machine; the descending lever carries another chisel, which passes down just clearing the other with the minutest accuracy. The points of the tip are now very sharp and jagged: they are smoothed bv being tumbled in pots for 30 hours with granulated fire-clay bricks. They then go to the inspectors' tables which are of black glass. Here each pen is scrupulously examined by an expert for accuracy of cutting, piercing, marking, raising, grinding, slitting, tempering and finish of point. Those which are passed as perfect are then polished in buffing boxes. If they are to remain their natural steel gray color they are at once lacquered. Or they may be plated with gold, silver or bronze. Or they may be colored brown, black or blue, by being heated in a revolving metal cylinder over a charcoal stove, and removing them when the desired tint is attained; they are then varnished by lac dissolved in naphtha. After being dried by heat they are counted mechanically into small boxes ready for the market. A large proportion of the cheaper grades of steel pens are now made on automatic machines which turn out the finished pens ready for lacquering. The annual production of steel pens in the United States is about 3,000,000 gross. About one-sixth of the total output is exported.

Gold Pens.— The gold pen is an American product and the world's supply is practically manufactured in New York. In 1823 John Isaac Hawkins, an American, residing in England, imbedded pieces of diamond and ruby in the points of tortoise shell pens, which were softened in water to receive the stones. The same manufacturer, hearing that bits of an extremely hard native alloy of iridium and osmium, sent by Dr. Wollaston to a penmaker to be used for points, had been returned as too hard for working, obtained these for his own experiments and was the first to produce the famous «diamond points» soldered to gold pens. The manufacture of these pens made but slow progress, great skill, the result of long continued experiments, being necessary to produce the exact shape suited for the required elasticity of the pen and to combine this with the proper size and form of the points. They were moreover costly as well on account of the metal employed as the labor expended in the manufacture. The right to make gold pens was purchased of Hawkins by Dr. Cleveland, an American clergyman then in England, who on his return induced Levi Brown, a watchmaker in Detroit, to undertake their manufacture. This was about the year 1835. The experiment was attended with little success. Brown removed in 1840 to New York and there introduced the business, which gradually increased in importance as the quality of the pens was improved and the price diminished by their more rapid production. At first the pens were cut with scissors into shape from a thin flat strip of gold and a slit being cut in the nib a bit of iridium was soldered to each point separately and the points were then rounded up into shape with a mallet upon a stick. The inferior pens thus made by hand sold for $5 to $10 each. The first machines and almost the only important ones in use applicable to the different branches of this work, were invented by John Rendell, who systematized the process, giving to each workman his peculiar branch and thus a nicety and certainty of good work were attained by each one which was essential to the perfection of the pen. In the process now in use the pure gold as it comes from the United States Assay Office is melted and alloyed with with copper and silver to a 14-carat degree of purity. It is then cast in the form of a bar which is rolled into strips 1.32 of an inch in thickness. The blanks are stamped out on a screw press. A notch is cut in the tip of each blank and a bit of iridium soldered in to form the wearing point. The pen is then «marked» with the maker's name, and curved to proper shape in a suitable press. The tip is then slit at the exact centre by a revolving copper disc coated with emery. The pen is brought to its desired shape and flexibility by grinding on copper wheels fed with emery and finally polished on buffing wheels coated with rouge. The pen then goes to an expert penman who tests its writing qualities and corrects any defects by regrinding with emery.

Fountain Pens.— From about the middle of the 19th century various attempts were made to construct fountain pens, that is, pens fitted with an ink reservoir from which the point is supplied by capillary or other action. The fountain pen now in use by the millions was the invention of Lewis Edson Waterman in 1883. It is a combination of a rubber barrel and a gold or gilded pen. The completed article as it appears in the market has passed through 210 distinct operations between the crude materials and the finished product. The making of the gold pen has been described above. The larger fountain pen factories make their own pens, but in some plants only the barrels are made and gold or gold-plated pens are bought from the pen makers and assembled by the fountain pen manufacturer. In making the barrel the crude rubber «biscuits» are sliced and ground up, the dirt being washed out by jets of water during the process. For 10 or 12 days the rubber is dried and cured in an oven kept at 135° F., and is then mixed with about one-third of its weight of sulphur in a mixing mill. From this the mass is passed through the sheeting rolls and the sheets are then cut into strips of two widths to form the barrel and the cap. These strips are delivered to workmen who sit at heated tables of polished steel and who roll the strips on small cylindrical mandrels and when the rubber is of the proper thickness wind both rubber and mandrel with metal foil. They are then packed in powdered soapstone in steel boxes, which are placed in a vulcanizer and kept at a temperature of 300° F. for 14 or 15 hours. A certain elasticity being required in the finished barrel, the vulcanizing must not be carried too far. After cooling, the cap and barrel are hand turned in a lathe, the barrel being tapered at both ends to fit the cap. Threads are cut for the «spoon» which feeds the ink to the pen; the ink fissure is routed out; and the air vent is bored. The parts are then in the rough and have to be polished on a cotton wheel buff coated with rouge. The chasing of the barrel is done with a diamond. The latest improvement in the fountain pen is an automatic filler, or, to be more exact, a device for filling the pen without removing the part containing the pen from the ink-reservoir, the ink being drawn through the pen, which is dipped into the well or bottle. Still another improvement is the screw force feed which overcomes the drawback experienced in the older models of the clogging of the ink channel through drying. The force feed is reversed to fill the pen. The annual production of fountain pens in the United States alone is between 7,000,000 and 8,000,000.

The Pen Industry.— Pens are now made in almost endless variety as regards shape and size, character of point, etc., as many as 2,000 distinct sizes and styles being offered by makers. The great centre of the manufacture is Birmingham, England, where more than 20,000,000 pens are turned out every week. France and Germany also manufacture steel pens and New York leads in the gold pen production of the world. Some idea of the growth of the pen industry may be obtained, therefore, when it is known that in 1860 nearly all the pens consumed in this country were of foreign manufacture. In 1860, Richard Esterbrook, his son Richard and James Bromgrove founded a pen factory at Camden, N. J. The business was a success from the start and in 1866 the firm was incorporated as the Esterbrook Steel Pen Company. In 1880 not more than $10,000 were invested in the pen industry. Besides the Esterbrook company, prominent pen manufacturers in the United States are Miller Brothers, Meriden, Conn.; Turner and Harrison and Malpass and Company, Philadelphia; and the Eagle Pencil Company; A. S. Barnes Company and Jos. Gillott and Sons, New York.

According to the 1914 census of manufactures there were in the United States in that year, engaged in the manufacture of steel pens, five establishments with an aggregate capital of $870,601, employing 243,043 hands and with an output for the year valued at $513,498. There were 12 establishments making gold pens, having a combined capital of $408,228, employing 174,209 hands and turning out a product valued at $642,461. There were also 55 establishments making fountain pens and stylographs, with $3,269,809 capital, employing 717,533 hands and a product valued at $6,865,074.

PEN ARGYL, pĕn är'jĭl (Welsh, *Argyl Head*), Pa., borough of Northampton County, on the Bangor and Portland and the Lehigh and New England railroads, 20 miles north of Easton. Its industrial activities include shoe factory, planing mill and several slate quarries. Pop. 3,967.

PEN-STIPPLE. See LITHOGRAPHY.

PENA, pä'nạ, **Carlos María de,** Uruguayan diplomat: b. 1852. In 1876 he received the degree of doctor of laws and social sciences at the University of Montevideo. From 1885 to 1911 Señor de Pena held the chair of political economy and administrative law at the University of Montevideo, where also he served as dean of the School of Law and Social Sciences. He was mayor of the city of Montevideo in 1889–90. He also was Secretary of the Treasury and Minister of Public Works, Industry and Public Instruction in the national government. In 1907 the government despatched him to a confidential mission to Brazil; in 1911 he was delegate to the Pan-American Conference at Buenos Aires and in the same year was named Uruguayan Minister to the United States. His published works include several volumes on the commerce, education and industry of his native land.

PEÑA, Rogue Saenz, Argentine president, son of Don Louis Saenz Peña, also President of Argentina: b. Buenos Aires, 19 March 1851; d. there, 9 Aug. 1914. His education at the law school of the University of Buenos Aires was interrupted by service in the army while a revolution was being suppressed, after which he completed his course. He was elected to Parliament in 1876 and in the following year became president of the Chamber, but resigned to offer his services to Peru in the war between that country and Chile in 1879–83. He was wounded and captured, but was released before the end of the war and returned to his own country. He was under-secretary for foreign affairs in 1881; and in 1882 was one of the founders of *Sud America*. He was appointed Minister to Uruguay in 1882; was a delegate to the first International Congress of American States in 1889–90; and was Minister of Foreign Affairs in the Cabinet of Juarez Celman in 1890. In 1906 he was appointed ambassador to Spain, and he was ambassador to Italy in 1907–10. He was elected President of Argentina in 1910, on a platform of agrarian reform. His administration was marked by the establishment of cordial relationships between Argentina, Brazil and Chile, resulting in the A. B. C. Entente. His work greatly strengthened the unity of the Latin races in America as well as fostered good feeling between his country and Spain and Italy. He died in office.

PENALTY, (1) Originally, a punishment inflicted, as for violation of the law; common in the phrase «death penalty.» (2) A sum of money agreed to be forfeited in case of non-performance or breach of a condition, as in a contract. A penalty, unless damages are uncertain or unless agreed upon as liquidated damages, will not be enforced either in a court of law or of equity. The language of the contract is not conclusive, and if the parties call it a penalty and it appears to be the amount of damages they believe will ensue from a breach, it will be enforced. (3) A sum of money recoverable by virtue of a penal statute for violation of its provisions.

PENANCE, a theological term, signifies first, a virtue, or condition of mind; secondly, an outward act or series of acts, expressive of the mental condition; thirdly,— according to the Catholic conception,— a sacrament; all having to do with the forgiveness or atonement of sin. The three various phases are not considered as independent, separate means for obtaining remission of sin, but as supplements, one of another: the penitential spirit is the primary necessity; the penitential exercise is the natural and obvious manifestation of the interior state of soul; and the sacrament is not a substitute for either the virtue or the act, but a complement of both. The necessary brevity of this article will allow only a most summary treatment of the virtue and only such mention of the penitential discipline as may come incidentally in the treatment of the main subject, the sacrament of penance.

1. «Penance,» the virtue, is synonymous with «repentance,» «contrition,» and such other terms as express sorrow for sin as an offense against the law and the person of God. All Christian theology agrees that without repentance of heart there can be no remission of sin. But as to the precise nature of this sorrow there is dissension. According to the Augsburg Confession (Art. XII), «Repentance consists of two parts; one is contrition or terrors stricken into the conscience through the acknowledgment of sin; the other is faith that for Christ's sake sins be forgiven.» The Council of Trent, teaching the Catholic doctrine, quotes the Lutheran definition, condemns it as insufficient and explains that for true repentance there must be not only present «contrition or terrors,» with «faith,» also a look into the past and a provision for the future; there must be «sorrow of mind, a detestation of past sin and a determination of not sinning for the future.» (Sess. 14, ch. 4.) However, Trent recognizes a distinction between perfect and imperfect contrition; that contrition is perfect which is motived by love of God, that is imperfect which is begotten of fear of the punishment due to sin. The former, sorrow for sin for God's sake, of itself immediately remits sin, even without sacramental absolution, provided it be accompanied by at least an implicit willingness on the part of the penitent to make use of whatever means God may have provided for the receiving of formal forgiveness. Furthermore, even by use of the sacrament, no one can possibly receive forgiveness unless he have at least the sorrow that comes from fear.

2. **The Sacrament of Penance.**—Any discussion about the existence of the sacrament may be narrowed down into an attempt to answer the question: did Jesus Christ, as the founder of a new religion, establish an institution for continuing visibly and through human instrumentality one of the chief works of salvation, the forgiveness of sin after baptism? Anyone, it would seem, who at all admits the sacramental idea in the Christian religion — who accepts, for example, the fact of baptismal regeneration, cannot logically maintain, *a priori*, the impossibility of the existence of a sacrament for the forgiveness of post-baptismal sins.

And indeed, whether there is or is not such a sacrament, is a question of historical fact rather than of theological theory; and the answer to the question must come from an examination of historical evidences.

The scriptural texts, offered as witness of the foundation of a special « ministry of reconciliation,» are three: St. Matt. xvi, 18, xviii, 18, and St. John xx, 22 and 23. In the two former passages, Christ is represented as bestowing, first upon Saint Peter and then upon all the apostles, the power of «binding» and «loosing,» and as promising that their exercise of that power should be ratified in heaven. The precise meaning of these two texts is not immediately evident: it may justly enough be maintained that, taken alone, they give no certainty of a delegation of the power of forgiving sins. It has been pointed out that «to bind» and «to loose» are formulæ of rabbinical theology meaning, «to prohibit» and «to permit»; hence a mere exegesis of these texts may show only that a general legislative and judicial power was granted to the apostles. But the supplementary passage of the Fourth Gospel apparently specifies one of the ways in which the general prerogative of binding and loosing is to be exercised. Saint John pictures the Lord solemnly praying over the apostles, breathing upon them in token of the imparting of the Holy Spirit, sending them forth, as He Himself had been sent forth from the Father and transferring to them His own divine prerogative of forgiving and retaining sins.

Taking the three texts together, it can scarcely be denied that even in their narrowest significance they witness the imparting of an authority to the Christian church to forgive and to retain sins in Christ's name.

This fact is not generally disputed. Protestants as well as Catholics maintain that the Church possesses and exercises the power of forgiving sins. The discussions have rather concerned the question, Who are the repositories of the pardoning power and what are the means by which it is exercised?

The Protestant party in the controversy declares that the power was bestowed not upon the apostles alone,— and hence not upon bishops and priests alone,— but upon the whole Christian church in general; and that the church exercises its power by conveying the «good tidings» to the world, by preaching and baptizing.

Catholics answer that such theories ignore the details of the incidents recorded in the texts of Saint Matthew and Saint John, which show that only the apostles were present when the Lord gave the commission of binding and loosing, of forgiving and retaining; that it is extremely unlikely that so wonderful a prerogative should have been conferred indiscriminately upon all; that to say sins are forgiven only by means of preaching and baptizing is to forget the discretionary and judicial character of the process which permits «binding» as well as «loosing,» «retaining» as well as «forgiving.» Such, in a word, is the status of the controversy concerning the exegesis of the scriptural texts.

But all parties concerned are agreed that a further and perhaps securer interpretation of the Lord's words is to be sought in an examination of the history of the early church; and, in fact, the vast bulk of modern discussion on the sacrament of penance has dealt with history rather than with exegesis. The adversaries of the Catholic position have, in this case, showed an unusual willingness to appeal from Scripture to Tradition. Catholic scholars, in turn, are no less confident of the outcome of a historical investigation of the origin of penance; but before undertaking it, they make certain provisos.

They are not loath to admit that the present very exact theology of the sacrament was by no means understood in all its details in the primitive church and that the modern discipline of the administration of penance is the outcome of a long process of — so to say — experimentation. For explanation of the divergences between the ancient and the modern practice and of the immense advance in certainty of theoretic understanding of the doctrine, they appeal to the principle of theological developments claiming for the sacrament of penance the same right to legitimate evolution which is acknowledged for all other Christian institutions. Starting with the essentials once necessarily determined by Christ, namely the forgiveness of sin by men judging in His name and absolving by His authority they are content if they can show by a recourse to historical documents that the nature of the sacrament was sufficiently clear, in its general outlines, from the beginning; that the forgiveness of sins from earliest Christian times was understood to be consequent upon sorrow of heart, acknowledgment of guilt,— either in the church publicly, or to a bishop or a priest privately, or both,— the performance of some penitential discipline and the pronouncement of reconciliation with the church and with God, by the president of the Christian assembly, the bishop, or his delegated priest. Here, in theological terms, are contrition, confession, satisfaction and absolution, the essentials of the sacrament. All else may vary and be doubtful, conditions and processes of administering and receiving forgiveness may change, the relative value of the constituent parts of the sacrament may be but obscurely understood, the positive and absolute obligation of confessing may not be universally defined until late in the history of the sacrament, public manifestation of conscience may be found inexpedient and private confession, instead of being an accompaniment or preparation for public confession, may survive alone; standards of discipline regulating the receiving of penitents and the imparting of absolution may vary from the extreme of severity to the extreme of leniency: along many lines there may be only a gradually increasing certainty of doctrine and a gradually crystallizing form of discipline, but, say the Catholic apologists, provided it can be shown that in details only and not in essentials, doctrine has been clarified and discipline changed, all this involves no incompatibility with the present teaching and practice of the Church.

Such is the viewpoint from which the defenders of the sacrament look upon the historical data, of which a very short summary may here be given.

The first historical evidence of confession in the Early Church is in the Acts of the Apostles (xix, 18). The converted Ephesians «came confessing their sins,» evidently not in secret or to God alone, but publicly in the assembly; and not in general terms only, but in some detail «declaring their deeds.» And the first clearly recorded instance of the exercise of the absolving power is the «binding» and the «loosing» of the incestuous Corinthian by Saint Paul (1 Cor. v, 5 and 13; 2 Cor. ii, 10).

Before the end of the first century, Saint Clement of Rome is recorded as urging penance in this world, because «there can be no *confession* or repentance in the other» (Ep. 2 and Cor. 8); and during the first half of the second century, the Didaché twice speaks of public confession in the Church. Any further information concerning the nature of these confessions, whether they were liturgical or sacramental, detailed or general, is not vouchsafed by the documents. They cannot, therefore, witness anything further than the fact that there was some kind of public confession in the Church of the 1st and 2d centuries.

Evidently this is meagre evidence, but explanations are given as to why it could not well be more explicit and satisfactory; first the extreme paucity of the documents of primitive Christian literature, and second the undoubted predominance in the sub-apostolic Church of a spirit and tendency which precluded the possibility of much direct advertence to an institution having to do with the forgiveness of sin committed after baptism. The theory was that there should be no such sin. «He who has received remission of his sins» (in baptism) «ought not to sin any more, but live in purity,» says Hermas Pastor (Comm. 4, ch. 3). The conception of the Church as a community of saints, the deep-seated expectation of the second coming of the Lord, the intense realization that baptism brought with it an eternal adjuration of evil, all made the commission of sin after the first regeneration a thing almost unthinkable, and while this idealism reigned, there could be only a kind of subconscious attendance to the existence of the sacrament of penance, and its use, in consequence, seems to have been almost in abeyance.

To such an extent did this kind of apocalyptic spirit predominate in the Early Church, that there was an uncertainty as to the method of treating sinners who, in spite of the theoretic impossibility, did actually lapse after baptism. At first they were in some places, and perhaps even at Rome, denied readmission to the Church. A too literal acceptance of the words, «It is impossible for those who were once enlightened and have tasted of the heavenly gift . . . if they shall fall away, to be renewed unto repentance (Heb. vi, 4ff.) led to a general belief that at least some sins were beyond the pardon of the Church (consult Hermas, Justin M., Dialogue, 44; Didascalia, ch. 5; Origen, De Orat. 28). But such a misunderstanding could not last. The Pastor (150 A.D.), after recording that «some teachers maintain that there is no other repentance than that which takes place when we descended into the water and received remission of our former sins," pleads for *only one* further opportunity for repentance. (Comm. 4, n. 3). Gradually the plea of the Pastor obtained recognition, its views were adopted by Dionysius of Corinth and Clement of Alexandria, and began to prevail, though against much opposition and some setbacks.

But alongside the movement toward a milder and saner discipline, there developed a conviction that at least the three capital crimes, murder, apostacy and adultery, were beyond forgiveness in this world. There are indications, however, that ultimate pardon from God for such sins was not despaired of; the guilty were recommended to do penance and to pray for pardon; but the Church refused to readmit them to her communion. Around this point of discipline the battle was again waged for and against relaxation.

Tertullian, in his tract, De Pænitentia (204 A.D.), affirms as a fact always recognized that the Church forgives sins, but maintains that repentance avails only once after baptism, there is a "second plank" of salvation after shipwreck but no third; and he not only accepts but adds to the list of "irremissible sins."

Pope Callistus (208–222 A.D.), however, following the primitive discipline observed by Saint Paul, absolved adulterers, but was roundly blamed for doing so, by Tertullian, now become a Montanist. (De Pudic, ch. 1). Still the milder discipline prevailed not only at Rome but at Carthage and Alexandria. In the latter city, Origen (184–253 A.D.) frequently declares in most explicit terms the doctrine of confession to the priests, absolution and renewal of repentance.

The Decian persecution (249 A.D.) turned the discussion upon the question of the pardon and readmission of apostates. Saint Cyprian, in the Council of Carthage (251 A.D.) declared the lawfulness of reinstating them, sent the reports of the proceedings to Pope Cornelius, and received his approval. Thereupon the schismatics, Novatian in Rome and Novatus at Carthage, anxious for a *casus belli*, started a reactionary movement, and maintained that apostacy and other heinous sins were unpardonable; and their followers, in the two succeeding centuries, finally went to the extremity of denying to the Church the power of forgiving anv mortal sins whatever. They raised the cry — now first heard in Christian history — "God alone can forgive sins," and thereby first demanded of the Church a systematic theological defense of the right she had long been exercising.

The reply was ready and decisive and came from all quarters. In Spain, Pacian (4th century) answers the Novation objection almost in the words of modern theology; God alone has the right to forgive sins, but He has been pleased to delegate His right, not to the Church in general but to the bishops, and the forgiveness of sins in penance is to be compared with that in baptism. In Italy the pseudo-Augustine and Saint Ambrose proclaim the same doctrine and use the same comparison. In Africa, Saint Augustine repeats the objection, and refutes it by an appeal to Matthew xvi, 18, interpreting the power of the keys as a power to forgive sins, granted primarily to Peter and his successors. In Constantinople, Gregory Nazianzen affirms the ancient and traditional rights of the bishop to forgive sins; and the Eastern Church generally was remarkable for its antagonism to the Novatian doctrine.

Thus, when the first real necessity arose, the latent theology of the sacrament came to the light, and the consensus of the Christian world was definitely expressed.

Further than this, the strife against Montanism and Novatianism elucidated not a few of the details of the doctrine; the actual necessity of the sacrament for the forgiveness of post-baptismal sin now was explicitly stated; the institution by the Lord himself was directly taught from the exegesis of the texts of Saint Matthew and Saint John, the designation of the bishops and priests as the legitimate possessors of the power of absolution was insisted upon, and in general, under the stimulus of opposition, the unfolding of the consciousness of the existence and the nature of a "ministry of reconciliation" went on apace.

Two questions of special interest may perhaps best be inserted here, before mention is made of the later phases of the theological development:

1st, the origin of *private,* or *auricular confession:* Some scholars, generally non-Catholic, have thought that private confession began in the monasteries, and thence was substituted for the public discipline. Others are inclined to think that auricular confession had its origin under Leo the Great (about 445 A.D.). Neither opinion seems to have the support of the documents. The Church historians, Socrates (H. E., 5–9), and Sozomen (H. E., 7–16), narrate the abolition of the office of private confessor at Constantinople, in the year 391, but both say that in their day, private confession was already an ancient custom. Socrates is of the opinion that it dates at least from the year 251, but Sozomen declares its origin is so far back in history that he dares not venture to name a date positively. Saint Cyprian (250) speaks of penitents confessing to the priests and the bishop (Ep. 58, 15), and Tertullian uses words indicating that private confession was in vogue in the beginning of the 3d century (De Pœn. x, 7 and 8); and even as far back as the first years of the 2d century there is, in Saint Ignatius (ad. Philad. viii) a possible reference to the private recourse of a penitent to his bishop. And in general, indications of the practice of private confession of smaller sins, and even of grievous sins for the purpose of receiving a preliminary judgment upon the necessity of exposing them publicly, are to be found in almost all the documents that have been cited as containing information on the ancient use of penance.

2d. The question as to the *sacramental character* of the penitential institution is evidently not to be answered by showing that there is no connection of the word *sacrament* with that of *penance* until late in the history of the Christian Church. This is admitted. But if without actually using the name, Christians believed and understood that penance was instituted by Christ, and that its purpose was to confer the grace of Christ by use of an outward form, this is sufficient to justify its title to the name *sacrament,* at least in the mind of the Church which applies the name to it.

To return to the general line of the historical description: in spite of the very definite theological teachings evoked by the Novatian controversy, it must not be imagined that the entire doctrinal theory of the sacrament was everywhere adequately understood. There was still abundant room for the expression of varying opinions. Saint Augustine, though in one place he seems to hint at the absolute necessity of absolution for the salvation of sinners, exclaiming, «what ruin will come upon those who depart this life unabsolved» (Ep. 180), does not, however, deny the possibility of their obtaining mercy from God. (Ep. 54). Likewise Cyprian, refusing absolution to «deathbed penitents,» has no fear that they are by his action excluded from forgiveness forever, and in fact, all through the Middle Ages, and even down to the 13th century, we still find discussions, for example, in the Decrees of Gratian, and in the «Sentences» of Peter Lombard concerning the precise purport of absolution, and its relative efficacy compared with the necessary interior contrition. Again, the Council of Chalons in the 9th century evidently considered the absolute *necessity* of confession an open question, though the Synod of Liège, in the 8th century, anticipated the fourth Lateran Council of the 15th century by commanding annual confession. In fact the dogma has, like every other, a history full of controversies, doubts, reactions and advances, all looking to precision of theological thought and utterance.

Evidently, then the conclusion to be drawn from any historical examination into the origin and growth of the institution of penance must largely depend upon the acceptance or rejection of the principle of development in theology. The investigator who would expect to find at every stage of Christian history the precision and fulness of the Tridentine decrees on the sacrament of penance, or not finding them, would condemn the institution as unChristian, will doubtless be compelled to the latter alternative; but if one is willing to admit that an institution may have been founded by Christ for continuing, in a visible, sacramental way, the forgiveness of sins, and that this institution may have undergone a natural and divinely directed development, eliminating errors, fixing truth and finally settling into definite theological shape — it is quite possible that to such a one the Catholic claim may seem well sustained by historical investigation. Such, at least, is the contention of modern apologists for the sacrament, who recognize that their task is not so much to show that confession, absolution and penitential satisfaction have always existed in the Church — for this is sufficiently evident,— but that the modern discipline and doctrine are a lawful evolution of the seed planted by Him who said to His apostles, «As the Father hath sent me, I also send you . . . whose sins you shall forgive they are forgiven them, whose sins you shall retain, they are retained.» (Saint John xx, 21-23).

The Roman Catholic doctrine of the sacrament of penance is shared by the schismatical churches: the Greek Church, separate from the 11th century, and the Nestorians, Jacobites and Abyssinians, separate from the 5th and 6th centuries, practise penance and hold it a sacrament.

Luther long wavered before rejecting confession and priestly absolution, as the Augsburg Confession and the Shorter Catechism testify. Even yet a limited confession is recommended in the Lutheran prayer-book, but the notion of absolution is gone. In general the reformers abolished the idea of the necessity of confession and the efficacy of absolution, though in many cases they recommended a voluntary partial manifestation of conscience. Members of the Anglican Church are coming quite generally to adopt and even to go beyond Dr. Pusey's very nearly Roman views. Some even admit the sacramental character of penance; though few, if any, have thus far considered its reception as obligatory and necessary for salvation.

Among Catholics in modern times there has been manifest a growing tendency to a devotional use of the sacrament. The law of the fourth Lateran Council (1215) prescribing annual confession for all members of the Church has merely decided the minimum of observance. The authoritative approbation of the confession of venial faults by the Council of Trent has immensely promoted the movement for frequent *confession,* and to-day the confessional is used to a great extent by the devout as a means of receiving «direction» for the conduct of the spiritual life, and all Catholics generally, whether or not conscious of grievous sin, always seek absolution before receiving the sacrament of the Eucharist.

James M. Gillis, C.S.P.

PENANG, pē-năng', or **PRINCE OF WALES ISLAND,** a small island of the Straits Settlements, belonging to Great Britain, lying at the north entrance of the Straits of Malacca, off the west coast of the Malay Peninsula, from which it is separated by a channel two to 10 miles across. The length of the island is 14 miles; breadth, 8 miles; area, about 106 square miles. The settlement of Penang also includes province, Wellesley, a long strip of the Malay Peninsula opposite the island, 45 miles long by eight and one-half broad; area, about 280 square miles; and the Dindings, which include the small island of Pangkor, off the coast of Perak, and a small strip of the mainland opposite, area about 13 square miles. The greater part of province Wellesley is fertile plain, and the remainder, about one-eleventh of the whole, consists of low wooded hills, the highest of which reaches a height of 1,843 feet. Two-fifths of Penang is plain, and the rest hills — for the most part wooded — which rise to a height of 2,734 feet. The climate is hot, but healthful; bracing sea-breezes blow every day, and rain falls every month during the year except January and February; temperature from 76° to 90° F. The rocks are granite and mica schist; the soil a rich vegetable mold. The settlement produces sugar, rice and cocoanuts in abundance; together with gambier, coffee, areca-nuts, ginger, pepper, cloves, sweet-potatoes, pineapples, shaddocks, bananas, oranges, lemons, plantains, mangoes, guavas, etc. Among timber trees are the teak, dammar-pine, caoutchouc, cypress, etc., and valuable gums and resins. Tigers, civets, wildcats, monkeys, wild oxen and hogs are natives, as are also pelicans, pea-fowl, adjutants (a kind of stork) and numerous species of brilliantly plumaged birds. Buffaloes and cattle are extensively raised for dairy or farm purposes, and hogs in great numbers by the Chinese for food. Goats and sheep are scarce, but poultry is plentiful. The coasts abound with fish, 20 varieties of which, chiefly caught by the Malays, are brought to the market. Tin-ore is abundant, but little wrought. George Town, or Penang, as it is generally called, the capital and port of the settlement, is situated on a tongue of land on the east side of the island. Pop. about 105,000, principally Chinese, many of them merchants and shopkeepers. The capital has an iron pier for steamers, and a large dry-dock. There is a steam ferry to Kuala Prai in province Wellesley whence a railroad extends into the interior. The exports in 1915 were valued at $60,061,280, and the imports at $67,063,065. The Dindings commerce is reported separately and amounted to: Exports, $330,070; imports, $418,130. The population of the whole settlement is estimated at 294,858. Penang was made over by treaty to the East India Company in 1786 by the Sultan of Kedah, and renamed the Prince of Wales Island. In 1805 it was erected into a separate presidency. Since 1867, with Singapore and Malacca, it forms a crown colony with a common governor, Penang and Malacca having each a lieutenant-governor. See STRAITS SETTLEMENTS.

PENATES, pę-nā'tēz, a group of household deities reverenced by the ancient Romans as guardians of the food supply — particularly of the storeroom and kitchen. They were without distinctive names, but each family was believed to have a separate deity belonging to the group, and in honor of which a flame was always kept burning on the kitchen hearth. It was customary also with the devout to make a burnt offering of a part of each meal in recognition of the protection and supply afforded. The images of these gods were kept in the penetralia, or central part of every house. The Lares were included among the Penates. Since Jupiter and Juno were regarded as the protectors of the family, these divinities were worshipped as Penates; and each hearth, as the symbol of domestic union, had also its Vesta. There were also higher groups of Penates who guarded the towns, and still higher who were supposed to watch over the prosperity of the state. The chief Penates at Rome were those that protected the empire. See LARES.

PENCIL, a small pointed brush used for painting, drawing and writing. The first drawing implements used by artists were probably crayons of colored earth or chalk cut into a form convenient for holding in the hand. With such instruments the monochromes, or one-colored pictures, of the Egyptians and Greeks were drawn. On the introduction of wet colors, however, delicate brushes of fine hairs were used. Pencils of this kind, and of various degrees of fineness, are almost solely used by painters for laying on their colors in water-color work, and occasionally for oil painting, but in China and Japan they are employed, instead of pens, for writing. The cheaper sorts are used in medicine for outward applications. The hairs used for these pencils are obtained from the camel, horse, badger, squirrel, sable, goat and one particular grade is made from the very delicate hairs from the inner ear of the ox. The finest pencils require very careful selection and arrangement of the hairs; their naturally fine points must all be in one direction; the central one must project the farthest, all the others receding in succession, so as to form a smooth cone terminating in a sharp point. The hairs, being selected, are bound in a little roll by a string tied tightly round their root ends; the points are also temporarily bound together. The roll is then introduced into the large end of a quill tube, which has been softened by moisture, and pushed through to the smaller end to a snug fit. As the quill dries the increased pressure caused by its contraction holds the hairs securely in their place; but the pressure should not be so great as to make the points spread apart when they are untied. For larger pencils a socket of tinplate or aluminum is used instead of the quill. Black lead pencils for writing or drawing, are made of graphite or plumbago. See LEAD PENCILS.

PENCIL-TREE, or **GROUNDSEL BUSH,** a branching glabrous shrub (*Baccharis halimifolia*), of the order *Compositæ,* and belonging to the thistle family. It is found, 3 to 10 feet high, common along the salt marshes and tidal rivers of the Atlantic Coast, from Massachusetts southward, and also along the Gulf Coast of Texas. It is frequently seen along the shores of Cuba and the Bahamas. Its brightly white pappus makes it very conspicuous in autumn.

PENCK, pěnk, **Albrecht,** German geologist and geographer: b. Leipzig, 1858. In 1878 he traveled over northern Germany and Scandinavia. He made several careful studies of the Bavarian and Tyrolean mountains in 1880 and later traveled in the Pyrenees and in the mountains of Scotland. He served as docent at Munich for some time, and in 1885 was appointed professor of physical geography at Vienna. He edited the 'Geographische Abhandlungen' in 1886 and contributed extensively to the *Geological Journal* of Chicago. In 1892 he was made president of the central commission for the study of the geography of Germany. He has written 'Die Vergletscherung der deutschen Alpen' (1882); 'Die Eiszeit in den Pyrenäen' (1884); 'Der Flächeninhalt der Österreichisch-Ungarischen Monarchie' (1889); 'Morphologie der Erdoberfläche' (1894), and he was joint author with Brüchner of 'Die Alpen in Eiszeitalter' (1901).

PENCO, pän'kō. See CONCEPCION.

PENCZ, pěnts, **Georg P.,** German painter and engraver: b. Nuremberg, about 1500; d. 1550. He probably was a pupil of Dürer and became a member of the Painters' Guild in 1523, but in 1524 he was tried for heresy and compelled to leave the city, together with his friends, Hans and Barthel Beham. He, however, returned in 1525 to the neighborhood, and after a visit to Rome, once more took up his residence in Nuremberg in 1532. Here he was given numerous commissions by the city council. In 1539 he again went to Rome to study Raphael and the Venetian masters and while there studied the art of engraving under Marc Antonio. He ranks next to the Behams among the 'Little Masters' and some of his plates equal if not surpass those of his teacher, Antonio. Among them are 'The Taking of Carthage' (1539); 'The Six Triumphs of Petrarch'; 'Life of Christ' in 26 plates; 'Medea'; 'Vergil and the Courtesan'; 'Paris,' and several portraits, the best of which is that of John Frederick, elector of Saxony. As an engraver he is considered as second only to Dürer. In his time he was called the best portrait painter in Germany. His paintings are mostly portraits and are among the best of those in the Germanic Museum, Nuremberg. He painted 'Saint Jerome' (1544); 'Field Marshal Sebaldus Schirmer' (1545), both in the Germanic Museum; 'Young Man' (1534); 'The Painter Erhard Schwetzer' (1544), and his 'Wife' (1545); all in the Berlin Museum; the 'Young Man' (1543) in the Vienna Museum, and the masterly portrait of a 'Scholar' in the Karlsruhe Gallery. His 'Adoration of the Magi' is in the Dresden Gallery; his 'Judith with the Head of Holofernes' in the Schleissheim Gallery, and his 'Crucifixion' in the Worlitz Gallery.

PENDENNIS. This novel by William Makepeace Thackeray was completed in 1850; it is great in virtue of the sincerity and justness of its conception, the variety and truthfulness of its characterization, and its fidelity to the essentials of that mid-Victorian life and society that will always possess significance. Written in a flexible, easy style that eludes notice by its very adequacy, the book lacks the purple patches of some of Thackeray's novels, but maintains throughout a high level of excellence. In plot it is an admirable example of simplicity in outline combined with intricacy in detail. It is a study of the development of Arthur Pendennis, an unheroic, very human hero, who goes to Oxford, is sent from the university in disgrace, returns and retrieves himself to the extent of winning his degree, fares forth into the world of men, makes a career for himself and after various love affairs marries the charming and forgiving Laura Bell. Thus outlined, the story is seen to depend less upon the striking nature of its incidents than upon the variety and vitality of its characters. These give the book its value. Around Arthur Pendennis are men and women as real as any that ever entered into the reader's own life: the immortal Major Pendennis; the gentle yet thoroughly feminine Helen Pendennis; the crude, sterling Foker; George Warrington, disillusioned but sound; the shiftless, fawning Costigan; Blanche Amory, the selfish sentimentalist. Moreover, these characters and their fellows are not mere types, but have the complexity, the mingled good and evil, of real human beings. They convey to the reader Thackeray's unrivaled knowledge of the men and women of his own day; and of the play of motives and intertwining of traits that persist from age to age. Less outspoken than its prototype, 'Tom Jones,' 'Pendennis' manifests greater range and subtlety, and will always remain one of the greatest of novels presenting the life and character and friends of a young man. Consult Trollope, Anthony, 'Life of Thackeray' (Chap. IV) and Ritchie, Mrs. Anne, 'Introduction to Biographical edition of Pendennis' (London 1898–99).

George B. Dutton.

PENDENTIVE, *in architecture,* the name given to the masonry construction built in the angle of two vertical walls as a support for a domed ceiling. The pendentive may start from a lintel placed across the angle or from a point in the line of intersection of the two walls, and may be plane, curved or carried up by corbeled courses. It is usually of the hollow spherical type, but often is conical — with the apex of the cone downward. It is a very common construction in the spandrels of large arches. In Gothic architecture the term is used to designate the portion of a groined ceiling springing from one pillar or impost and bounded by the ridges or apices of the longitudinal and transverse vaults.

PENDER, Harold, American electrical engineer: b. Tarboro, N. C., 13 Jan. 1879. In 1898 he was graduated at Johns Hopkins University; in 1901–02 was teacher at McDonogh School, Maryland; in 1902–03 instructor in Syracuse University; in 1903 at the Sorbonne, Paris; in 1904 electrical engineer with the Westinghouse Electric and Manufacturing Company; in 1904–05 with the New York Central Railroad. From 1905 to 1909 he was associated with Cary T. Hutchinson, electrical engineer, New York; in 1909–13 professor of electrical engineering at the Massachusetts Institute of Technology, where in 1913–14 he was director of research of the division of the department of electrical engineering. Since 1914 he has been in charge of the department of electrical engineering at the University of Pennsylvania. He has published 'Principles of Electrical Engineering' (1911); 'Electricity and Magnetism for Engineers' (1918); and numerous scientific and technical papers. He was editor of the 'American Electrical Engineering Handbook' for 1914.

PENDER, Sir **John,** Scottish pioneer in submarine telegraphy: b. Vale of Leven, Dumbartonshire, Scotland, 10 Sept. 1815; d. Kent, England, 7 July 1896. He was educated in the Glasgow high school, entered the counting-house of a Glasgow textile firm and in three years became its manager. He made the business his own under the firm name of J. Pender and Company, and it became one of the most important in the country, meantime accumulating for its owner an immense fortune. In 1856 he joined Cyrus W. Field (q.v.) in his projected enterprise of a submarine cable and was one of the original contributors to the fund raised to finance it. He held the office of chairman of the Anglo-American Company, and when, after years of failure and losses, the venture was about to be abandoned, he pledged his entire fortune as security for the new cable — which was successfully laid in 1866. Upon its completion he immediately organized companies to connect Great Britain with other parts of the world, and by 1882 66,000 miles of cable had been laid. He was knighted in 1888, sat in Parliament for Totnes in 1862–66, for the Wick Burghs in 1872–85, and 1892–96, at first as a Liberal, and in his last years as a Liberal Unionist. He was a member of many of the learned societies and held several foreign orders, among them the Legion of Honor and the Grand Cordon of the Medjidie. In 1869 he published 'Statistics of the Trade of the United Kingdom, from 1840.'

PENDER, William Dorsey, soldier: b. Edgecomb County, N. C., Feb. 6, 1834; d. Staunton, Va., July 18, 1863. In 1854 Pender was graduated from West Point and entered upon military service in the far West. In 1861 he resigned and entered the Confederate service as captain, and in 1863 had reached the grade of major-general. He fought in the battles and campaigns of the Army of Northern Virginia and was wounded many times. His most distinguished service was at Seven Pines, first Cold Harbor, second Manassas, Sharpsburg and Chancellorsville. He was mortally wounded at Gettysburg.

PENDLETON, pĕn'd'l-tŏn, **Edmund**, American statesman and jurist: b. Caroline County, Va., 9 Sept. 1721; d. Richmond, Va., 23 Oct. 1803. He was apprenticed in 1734 to the clerk of Caroline court, three years later became clerk of the vestry of Saint Mary's parish and was licensed in 1741 to practise law, in which profession he soon attained eminence. In 1751 he was made justice of the peace in his native county, an office which he held until 1777, when, by an accident, he was crippled for life. Meanwhile he was developing planting interests on a large scale, grants in his name numbering nearly 10,000 acres being on record. In 1752 he was elected to the House of Burgesses, and represented his county in that legislative body without interruption until it became extinct at the outbreak of the Revolution. Though he had been a member of the committee of the Virginia legislature, appointed, in 1764, to draw up memorials to the king, lords and Commons of England, protesting against the proposed Stamp Act, Pendleton, the following May, opposed Patrick Henry's famous resolutions, declaring «that the General Assembly of this colony have the only, sole and exclusive right and power to lay taxes.» He opposed likewise as premature Henry's resolution of 1775, «that this colony be immediately put into a posture of defence.» Pendleton may be regarded as the leader of the conservative party in Virginia, resisting change, but never reactionary after change had once been instituted.

In 1773 Pendleton was made a member of the Committee of Correspondence, which instantly gave a vigorous impulse to the colonial cause. In 1774 he was elected to the first Virginia convention, which met on 1 August, to respond to the call from New England touching the Boston Port Bill. This convention took steps for a general congress, to which Pendleton was sent as a delegate. Upon the dissolution of the royal government in Virginia, by reason of the flight of Lord Dunmore from the capital at Williamsburg, he was made president of the Committee on Public Safety, which piloted the colony during the trying times from 17 Aug. 1775 to 5 July 1776, when Patrick Henry took the oath as governor of the commonwealth. Acting in this capacity, Pendleton was virtually the ruler of Virginia in this transitional period.

Pendleton presided over the conventions which met in December 1775 and May 1776, the latter framing the Virginia constitution and directing the Virginia delegates in Congress to bring forward a motion declaring the independence of the united colonies. The resolution embodying these momentous instructions was drawn by Pendleton, and his words were incorporated almost as written into the Declaration of Independence. In collaboration with Jefferson and George Wythe, Pendleton revised the laws of Virginia in accordance with the changed political situation. As president of the Court of Chancery, he presided from 1779 over the Court of Appeals, and thus for 15 years acted as head of the Virginia judiciary. In 1788 he was elected president of the Virginia convention which ratified the Constitution of the United States. Pendleton was a Nationalist even at that early time, and was a staunch supporter of peace. When war seemed imminent with France in 1798 he protested against fighting a sister republic. In his intuitive love of prescription, in his willingness to be pushed along the line of reform only by incontrovertible facts and in his efficiency in carrying out the details of a policy he had strenuously opposed in debate, he is strikingly like Sir Robert Peel. Jefferson said of Pendleton: «Taken all in all, he was the ablest man in debate I ever met.»

S. C. Mitchell,
President of Delaware College, Newark, Delaware.

PENDLETON, Ellen Fitz, American educator: b. Westerly, R. I., 7 Aug. 1864. In 1886 she was graduated at Wellesley College and subsequently studied at Newnham College, Cambridge, England. In 1886–88 she was tutor in mathematics and from 1888–97 instructor at Wellesley. From 1897–1901 Miss Pendleton was secretary of the college; in 1901–11 dean and associate professor of mathematics, and after 9 June 1911 president of Wellesley. In 1911 Miss Pendleton received the degree of Litt.D. from Brown University and in 1912 that of LL.D. from Mount Holyoke College.

PENDLETON, George Hunt, American legislator: b. Cincinnati, Ohio, 25 July 1825; d. Brussels, Belgium, 24 Nov. 1889. He was educated in Cincinnati and Heidelberg, Germany, studied law and was admitted to the bar. In 1854–55 he served in the State senate and was a member of the House of Representatives from his State from 1856–65. Throughout the Civil War he strongly opposed the administration, and in 1864 was candidate for the Vice-Presidency on the Democratic ticket with George B. McClellan. He ran for governor of Ohio in 1869, but was defeated. In 1878 he was elected United States senator from Ohio, and in 1882 he introduced the civil service reform bill known by his name and passed in 1883. In 1885 he was appointed by President Cleveland United States Minister to Germany.

PENDLETON, Louis (Beauregard), American novelist: b. Tebeauville (now Waycross), Ga., 21 April 1861. He was educated in Philadelphia and among his published novels and juveniles are 'Bewitched' (1888); 'In the Wire Grass' (1889); 'King Tom and the Runaways' (1890); 'The Wedding Garment' (1894); 'The Sons of Ham' (1895); 'In the Okefinokee' (1895); 'Corona of the Nantahales' (1895); 'Carita' (1898); 'In the Camp of the Creeks' (1903); 'A Forest Drama' (1904); 'In Assyrian Tents' (1904); and a 'Life of Alexander H. Stephens' (in the 'American Crisis Biography Series' 1908).

PENDLETON, William Kimbrough, American educator: b. Yanceyville, Louisa

County, Va., 8 Sept. 1817; d. Bethany, 1 Sept. 1899. He received his education at the University of Virginia, and, after graduating from the law school, was admitted to the bar. He joined Alexander Campbell in 1841 in founding Bethany College, the first educational institution of the "Disciples of Christ," also known as the "Campbellites," becoming professor of sacred history and philosophy, belles-lettres and political economy. From 1866 to 1887 he was president of the university. He served in the West Virginia Constitutional Convention. His activity in establishing a free-school system earned him the appointment as State superintendent of schools, in which position he served four years. In 1887, because of failing health, he removed to Florida. He died while on a visit to his old home at Bethany.

PENDLETON, William Nelson, American Episcopal clergyman and soldier: b. Richmond, Va., 26 Dec. 1809; d. Lexington, Va., 15 Jan. 1883. He was graduated from West Point in 1830, served there as assistant instructor in mathematics in 1831–32, resigned from the army in 1833, engaged in teaching mathematics in Bristol College, Pa., and in Delaware College. Resigning from the army he entered the Episcopal ministry, as a deacon, in 1837. The following year he was made a priest, and in 1839 he established the Episcopal high school in Alexandria, Va., and was its principal until 1853 when he was called to the charge of a church in Lexington, Va. In 1861 he entered the Confederate army as captain of artillery, was promoted to be chief of artillery in the Army of the Shenandoah and in 1862 received the rank of brigadier-general. He was engaged in all but three of the battles fought by the Army of Northern Virginia, beginning with Bull Run, was one of the commissioners appointed by General Lee to arrange terms of surrender in 1865, and then returned to his parish in Lexington, where he remained until his death. He received the honorary degrees of A.M. from Brown University, and D.D. from Kenyon College, and also from the Alexandria Theological Seminary. He published 'Science a Witness for the Bible' (1860).

PENDLETON, Ore., city, county-seat of Umatilla County, on the Umatilla River, and on the Oregon-Washington Railroad and Navigation Company's Railroad and the Northern Pacific Railroad, 206 miles east of Portland and 35 miles southwest of Walla Walla, Wash. The city was enlarged in 1884 by the addition of 640 acres of the Umatilla Indians' reservation. It is built on both sides of the river, which is here crossed by three bridges. The river affords good water power for manufacturing; the chief industrial establishments include flour mills, iron foundries, machine shops, woolen mills, planing mills, a harvester factory and a paper mill. There are also a grain elevator and a packing-house. The city has a high school and is the seat of Saint Joseph's Academy, a Roman Catholic school with elementary and secondary grades. The State Hospital for the Insane for Eastern Oregon is located here. The city has recently had an addition to its important buildings in the new Federal building ($130,000), and the new Public Library ($40,000). It has a wide celebrity through its annual exhibition festival, "The Round-Up." The waterworks are under municipal ownership and control. Pop. about 7,500.

PENDULUM, a mechanical construction of interest from two widely different points of view: the practical and the mathematical. It consists typically of a comparatively large and concentrated weight called the bob, and some sort of suspending material, usually of wood or metal, and called the rod. In considering the mechanics of the pendulum, it is customary to think of the suspension as a thread without weight, so that only the weight of the bob comes under discussion. In a state of equilibrium it is evident that the weight of the pendulum will hang motionless directly below the point of suspension. Upon moving the weight to one side of this central position and then releasing it, it swings down an arc of which the thread is the radius, toward the point of rest from which it was moved. The force which urges it down along the arc is not a simple force, but the resultant of two forces, one of which is gravity, acting vertically downward, and the other the pull of the thread, acting toward the point of suspension. As the weight swings down the arc, it gathers momentum — that is, weight multiplied by speed. When the bob has reached the lowest point of the arc, its accumulated momentum prevents it from stopping there, and it swings on upward over a similar arc until its momentum is expended — that is, until the force of gravity and the pull of the string combined overcome its impulse of motion. Obviously, if there were no exterior force applied the upward swing would be exactly equal to the downward swing, and once started the pendulum would swing on, to and fro, forever. But because of the friction of the air upon the bob the motion slows down until it finally ceases, and the bob again hangs at rest vertically below the point of suspension.

These simple motions of the pendulum are of great interest to the physicist, who sees in the instrument an engine for the transmutation of potential energy into kinetic energy. For as the bob swings down the arc it stores within itself potential energy to its lowest position in the arc. At this point, however, the potential energy becomes kinetic energy and drives the bob up the opposite arc, against the continuing pull of gravity.

The remarkable regularity with which the pendulum swings early commended it to clockmakers as a governor, to control and space off accurately and evenly the speed with which clock mechanisms ran down after winding. This was accomplished by an escapement wheel geared into the mechanism of the clock, and restrained by a release operated by the pendulum. In this way the pendulum was left free to swing, the delicate push of the escapement wheel being just sufficient to counteract the friction of the air on the bob. With this application to timekeeping, it became of interest to the clockmakers that the pendulum should be made of such a length as to beat exact seconds; and as the force operating the pendulum was gravity, the problem became somewhat complex, for the force of gravity was known to change with every variation of latitude, due to the flattening of the earth at the poles. The attraction of gravitation being less at the equator than at the poles, the seconds-pendulum at the equator would be shorter than at the poles, where the attractive force was greater. The two extremes at which experiments were conducted were Hammerfest, Norway, in latitude 70° 40′ N., where the value of gravity was found to be 32.2364 feet per second; and Saint Thomas, an island off Portuguese West Africa, in latitude 0° 25′ N., where the value of gravity is 32.0957 feet per second. The length of the seconds-pendulum at Hammerfest is therefore 39.1948 inches, and at Saint Thomas, 39.0207 inches. At New York City, latitude 40° 43′ N., the seconds-pendulum is 39.1012 inches.

The seconds-pendulum was useful only in clocks of large size, like the so-called «grandfather's clock,» and long wall clocks. The demand for small shelf clocks led to the arrangement of the clock train for a pendulum of 9.78 inches, beating half-seconds. For tower clocks the two-second pendulum of 13.04 feet is commonly used. Longer pendulums have been experimented with, but have proved troublesome to manage. The swing of the ordinary clock pendulum is through three degrees of arc, which length has given the most accurate results.

One of the peculiarities of the pendulum in its adaptation to the clock is that it is affected by changes in the pressure of the atmosphere. This is known as the barometric error. As the barometer falls, indicating a decrease of the pressure of the air, the pendulum spontaneously extends its arc of oscillation. This would make no difference in the time of its beat if the arc of the circle in which it swings were the isochronal arc of the pendulum — that is, the arc all parts of which are passed over by the swinging bob in equal sections of time. This, however, is not the case. The isochronal arc of the pendulum is the cycloid (q.v.), and while a very small arc of a circle does not depart from that of the middle of a cycloid to a practical degree, the longer the arc the greater the difference; and hence, the extension of the circular arc through lessening of the air pressure becomes a source of error in the precision of beat required for accurate timekeeping. In the delicate adjustment of the clock at Westminster, the two-seconds pendulum is made to swing over an arc of 5.5 degrees. With this length of arc the barometric error is exactly neutralized by the circular error arising from its extension. Another common source of error in the clock pendulum is that due to the extension of its length by a rise in temperature, and vice versa. This variation affects chiefly the length of the rod, but unless the bob is suspended from its centre of gravity, the expansion of the bob also may act to disarrange the timekeeping qualities of the clock. For ordinary clocks a pendulum constructed with a wooden rod rendered impervious to moisture by soaking in melted paraffin wax, with a hollow cylindrical bob of lead supported at its bottom edge, is self-compensating for the usual range of house temperatures. For clocks of precision, the gridiron or mercury compensating pendulums, described below, are employed.

In the mathematical discussion of the pendulum it is convenient to begin with the «simple pendulum,» in which the bob is conceived to be a mere material particle, and the suspending rod is assumed to be devoid of mass, and the motion is assumed to be confined to some one vertical plane passing through the point of support, and all retarding influences, such as the resistance of the air and the friction at the point of support, are neglected. The «period of oscillation» of any pendulum is defined as the time occupied by a single oscillation, counting from the instant when the pendulum is at its extreme position on one side of the vertical, to the instant when it next arrives at its extreme position on the other side of the vertical. It is easy to show that the period of oscillation of the simple pendulum, as defined above, is practically independent of the arc described by the bob, provided that arc is very small; this fact being expressed, in mathematical language, by stating that the vibrations of the simple pendulum are «isochronous,» when the amplitude of the vibration is small. It may be readily shown, in fact, that the period of oscillation of a simple pendulum is given by the expression $3.1416\ B\ \sqrt{L/G}$, where L is the length of the pendulum, G is the intensity of gravity (that is, G is the velocity that a freely-falling body would acquire in one second), and B is a function of the arc, A, through which the pendulum swings, in passing from one of its extreme positions to the other. The function B may be expressed in terms of A by means of a series in which A occurs only in ascending even powers: $B=1+\frac{A^2}{64}+\ldots$ When the arc, A, is very small, we may take B equal to unity in all cases, save those in which the highest possible refinement is required; and hence, in all ordinary computations, we may take the period of oscillation of the simple pendulum to be $3.1416\ \sqrt{L/G}$, when the amplitude of the oscillation is small. If L is expressed in feet, and G in feet per second, the foregoing formula gives the period of oscillation in seconds. To find the length that a simple pendulum must have, in order that its period of oscillation may be precisely one second, we have only to set the foregoing formula equal to unity, and solve the resulting equation for L. Thus we have, for this case, $L=\frac{G}{(3.1416)^2}$. The value of G varying according to the latitude, we may use $G=32.2$ as its average value, and this last formula shows that a simple pendulum, in order to have a period of oscillation of one second, must have a length of about 3.263 feet, or 39.150 inches.

A pendulum, when once set in vibration in a given vertical plane passing through its point of support, continues to vibrate in this same plane unless forced to depart from it by the application of some external force other than gravity. Foucault took advantage of this fact for experimentally demonstrating the rotation of the earth. In 1851 he constructed a pendulum which was approximately «simple,» being composed of a heavy sphere of polished metal, suspended by a steel wire about 65 metres long. The experiment was performed under the dome of the Pantheon, at Paris. A pendulum of this sort, if set in vibration in a vertical plane at the earth's pole, would continue to vibrate in the same constant plane, while the earth rotated under it at the rate of 360° every 24 hours, or 15° every hour. The rotation of the earth would therefore become evident to the eye; though, since the observer would be rotating with the earth, it would appear to him as though the earth were stationary, and the plane of the pendulum's motion were rotating. The phenomena would be somewhat more complicated in other latitudes, however, because it is only at the poles that the direction in which gravity acts remains constant while the earth rotates. Foucault showed that when allowance is made for the changing direction of gravity, the plane of vibration of a simple pendulum, in the latitude of Paris, should appear to rotate by 11° 17′ 33″, per sidereal hour; and when the experiment was tried with the giant pendulum that he erected in the Pantheon, the actual apparent rotation was found to agree very closely with this theoretical value. Since 1851 this experiment has been tried many times; and a pendulum that is arranged, in accordance with Foucault's plan, for the purpose of demonstrating the rotation of the earth, is now known as a «Foucault pendulum.»

Any pendulum whose mass is not wholly concentrated at a single point is said to be «compound.» The simple pendulum is a convenient mathematical abstraction (such pendulums as Foucault's being merely close approximations to it); but we must, in strictness, regard all actual pendulums as compound. Fig. 1 represents a compound pendulum of generalized form, which is supposed to be vibrating in the plane of the paper (held vertically), about a horizontal axis passing through O, which is called the «axis of suspension.» If G is the centre of gravity of the pendulum the foot of the perpendicular that is let fall from G to the axis of suspension is called the «centre of suspension.» In the same straight line with O and G there is a point C, called the «centre of oscillation» (or, sometimes, the «centre of percussion»), which has the following properties: (1) The time of vibration would remain unaffected, if the entire mass of the pendulum were concentrated at C. (2) If the pendulum were inverted, and C were taken as the new centre of suspension, the period of oscillation would remain unchanged. (3) The period of oscillation of the actual, compound pendulum is the same as the period of oscillation of a simple pendulum having a length OC; and hence OC is commonly called the «length of the equivalent simple pendulum.» To find the position of C, let H be the distance, OG, from the centre of suspension to the centre of gravity, and let K be the radius of inertia of the pendulum (that is, its moment of inertia divided by its total mass), with respect to an axis passing through G, and parallel to the axis of suspension. Then the distance, L, from O to C, is given by the expression $L=(H^2+K^2)/H$. Evidently L is always greater than H.

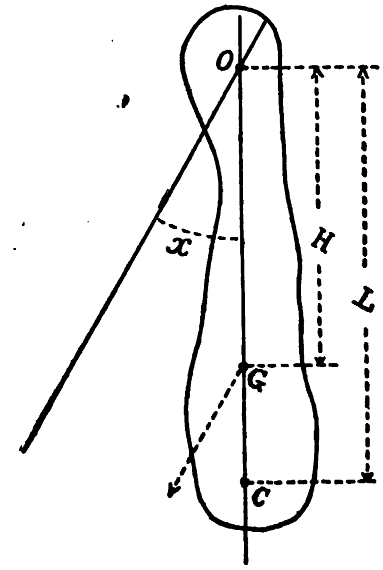

Fig 1.

In a piece of apparatus, such as an astronomical clock, in which it is important to have a pendulum execute its vibrations always in the same time, the temperature must be kept constant, or else some compensatory device must be employed, which will eliminate the effects due to its variation. Uniformity of temperature is important in all cases, because none of the compensation devices are perfect; and clocks of precision should be kept in rooms whose temperatures vary as little as possible. In such cases it is often sufficient to make the suspending rod of the pendulum of well-seasoned pine or fir since the coefficient of expansion of these woods is small, and if the temperature change is also small its effect upon the rate of the clock may become almost indistinguishable. Wooden pendulum rods are apt to be affected by changes in the hygrometric state of the air but this can be prevented by a good coat of varnish and the use of a suitable drying medium within the clock case. In Germany clock pendulums are commonly made of an alloy of nickel and steel which is known as «invar,» and which has a coefficient of expansion that is almost negligible.

«Compensation pendulums» are those in which provision is made for the automatic elimination of the effects of changes of temperature. Of these the two commonest forms are the «gridiron» pendulum and the mercury compensation pendulum. In the gridiron form the bob is supported by means of a series of parallel bars, somewhat as represented, diagrammatically, in Fig. 2. In the diagram the central bar and the two outside ones are of steel, while the intermediate ones are of zinc, or, very commonly, brass. If the zinc bars should expand while the steel ones remained constant in length, the bob of the pendulum would evidently be raised; and if the steel ones should expand while the zinc ones remained constant in length the bob would be lowered. In the actual case, where a rise of temperature causes the zinc and the steel to expand simultaneously the effects of the two metals, in displacing the bob are therefore opposed. The effective length of the steel rods is about twice that of the zinc ones; but, on the other hand, the coefficient of expansion of zinc is about twice that of steel. On the whole, therefore, the position of the bob is not materially affected by a change of temperature.

In the mercury compensation pendulum the supporting rod is a simple bar of steel, but the bob consists of a cylindrical glass vessel containing mercury. A rise in temperature causes the suspending rod to dilate, and this tends to lengthen the pendulum. The mercury in the bob expands at the same time, however, and the centre of gravity of the mass of mercury therefore rises. The expansion of mercury is considerably greater than that of steel, and by properly proportioning the apparatus it is possible to make the rise of the centre of gravity of the bob, due to the expansion of the mercury, sensibly equal to the fall of the bob as a whole, due to the expansion of the supporting rod. The Riefler pendulum used in astronomical clocks has its tubular rod filled about two-thirds its length with mercury, thus acting as a compensator for both temperature and barometric changes.

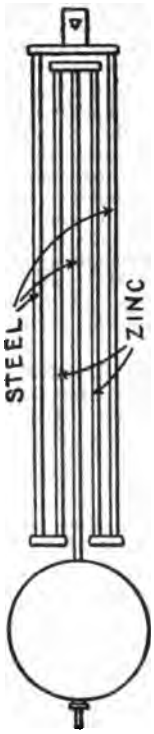

FIG. 2.

The fact that G, the accelerating effect of gravity, enters into the expression for the period of oscillation of the pendulum, suggests the use of this instrument for the determination of the value of G; and in fact it has been found that no other method of determining the intensity of gravity is comparable in accuracy with the pendulum method.

In determining the intensity of gravity by the pendulum. two general methods are followed, according as it is desired to make an «absolute» or a «relative» determination. The absolute determination is much more difficult to execute, because it necessitates the careful measurement of the length of the pendulum, and the determination of certain rather troublesome corrections. In principle it is simple enough, however, for if we knew the length of the pendulum (L), and its period of oscillation (T), we should merely have to substitute their values in the equation $T=3.1416\sqrt{L/G}$, and solve for G, which would be the only remaining unknown quantity. In relative determinations it is not necessary to measure the length of the pendulum (except roughly, for the purpose of making certain small corrections to the observations), the pendulum being merely vibrated in two different places, at one of which the intensity of gravity is known. If T_1 and T_2 are the times of oscillation in the two places, and if G_1 and G_2 are the corresponding intensities of gravity at these places, we have $T_1=3.1416\sqrt{L/G_1}$, and $T_2=3.1416\sqrt{L/G_2}$. Since L remains the same during such a determination, we find, by division, $T_1/T_2=\sqrt{G_2/G_1}$; or $G_2=G_1T_1^2/T_2^2$. Hence, as G_1 is supposed to be known, and T_1 and T_2 have been measured, the value of G_2 is also known.

Pendulums that are to be used in determining the intensity of gravity are provided with steel knife edges, resting upon agate bearing plates as the suspension axis; the friction of the supports being reduced, by this device, almost to zero. Those which are to be used in relative determinations need not necessarily have more than one set of knife edges; but when an absolute determination is to be made, it is essential, in order to secure a high degree of accuracy, that two sets of knife edges should be provided, each being placed, as nearly as possible, at the centre of oscillation of the pendulum, relatively to the other one. If it were mechanically possible to realize this adjustment perfectly, the pendulum would vibrate with precisely the same period of oscillation, whether it were supported from one set of knife edges, or from the other one; and the distance from one of these sets to the other one would be precisely equal to the «length of the equivalent simple pendulum,» which is denoted in the foregoing formulæ by L. In practice, however, it is not possible to place the knife edges so that the period of oscillation is not measurably altered by reversing the pendulum; and this fact makes it necessary to determine the period of oscillation twice,— once before reversal and once afterward. The distance between the knife edges must then receive a small correction, in order to deduce the «length of the equivalent simple pendulum»; but this branch of the subject is too technical for treatment in the present article. (Consult Clarke, 'Geodesy'; also the various 'Appendices' of the United States Coast and Geodetic Survey, bearing upon pendulum work). The use of the reversible pendulum, which is based upon Huyghens' theorem that the centres of suspension and oscillation are reciprocal, is due to Captain Henry Kater, of the British Army, who first employed it in 1818, for determining the length of the seconds-pendulum at London.

The «ballistic pendulum» is an apparatus for determining the velocity of a bullet. It is suspended in the usual way from a fixed horizontal axis, and the bob consists of wood or other suitable material, weighted, when necessary, by the addition of iron or lead. The pendulum being at rest in a vertical position, the bullet is fired into the bob, and the height to which the pendulum bob rises in the initial swing is noted. The speed with which the bullet entered the bob may then be computed, if the masses of the bullet and the bob are known. The ballistic pendulum is not a very accurate instrument, partly because it takes no account of the thermal phenomena that occur when the bullet enters the bob, and partly for other reasons. It has now been almost entirely discarded, the velocities of projectiles being measured by more direct methods, that are capable of much greater precision.

The so-called conical pendulum, gyroscopic pendulum and torsion pendulum are not pendulums in the accepted sense of the term, and are not governed by the laws which control the pendulum, but by the laws of centrifugal motion. Consult United States Coast and Geodetic Survey, ‹Special Publications› 10 and 12 (Washington 1912).

A. D. Risteen, Ph.D.

PENEDO, pā-nā'do, Brazil, city and port of the state of Alagoas, 70 miles southeast of Maceio, on the left bank of the São Francisco and about 26 miles from its mouth. It is located on a rocky bluff at the head of ocean navigation and is the transshipping point for the steamboat commerce of the upper river for 150 miles. It is the oldest settlement in the state, having been founded by the Portuguese about 1620; has ruins of a 17th century fort; contains several convents and schools; and now does considerable business in foodstuffs with Pernambuco and Bahia, with which it has regular steamer connections. There is fine fishing in the river. Pop. (estimated) 9,000.

PENELOPE, pẹ-nĕl'ō-pẹ, in Greek mythology, the daughter of Icarios and Peribœa, also known as Polycasté, of Sparta. When she reached womanhood her extraordinary beauty attracted many suitors, and her father promised to give her to the conqueror in a foot race. Odysseus (Ulysses) won the prize, but Icarios tried to persuade his daughter not to accompany Odysseus to Ithaca. The young victor allowed her to decide for herself, whereupon she covered her face with her veil to hide her blushes, thus intimating her desire to follow her husband. The fruit of the marriage was an only child, Telemachus, who was but an infant when his father was sent by the Greeks against Troy. During the protracted absence of Odysseus, which lasted 20 years, he was generally regarded as dead, and Penelope was surrounded by a host of suitors. Some writers assert that she became the mother of Pan by Hermes, or by all the suitors together; that her husband repudiated her on his return, and that she went to Sparta and thence to Mantinea, where her tomb was shown in after ages. The story generally accepted, however, describes in detail the artifices by which she put off deciding between the suitors, and one of these ‹Penelope's Web› has become proverbial. She promised a decision when the web she was weaving should be finished. But at night she secretly unraveled what she had woven through the day. Finally being driven to a decision, she agreed to bestow her hand upon the winner in an archery contest. Her husband returned in time to take part in disguise in the contest and was the winner. See Odyssey; Ulysses.

PENEPLAIN, pē'nẹ-plān' (almost a plain), a plain cut by the erosive activity of running water. A region which has been cut as low as its rivers can plane it is said to be peneplained or base-leveled. Many once mountainous regions have been thus cut away to nearly level plains. The even sky-line of the New England uplands and the Appalachian Mountains, cutting across the upturned edges of hard and soft rocks, represents such a plain formerly reduced nearly to sea-level, but again uplifted and redissected by its streams. This very extensive peneplain was formed in Jurassic (q.v.) and Cretaceous (q.v.) time, and has been called the great Cretaceous Peneplain. It has also been called the Kittatinny or Schooley Peneplain, since it forms the even crest line of the mountains of those names. Any residual elevation not completely planed away and rising notably above the general level of a peneplain is called a monadnock, from the mountain of that name overlooking the New England Peneplain in New Hampshire. For an account of the process of peneplanation, see the section on the work of running water in the article on Geology.

PENETANGUISHENE, pĕn-e'tăn-gwish-ĕ'nē, Canada, town in Simcoe County, province of Ontario, on Georgian Bay and on the Grand Trunk Railway. It contains a Carnegie library, insane hospital, leather, lumber and engine works, foundries and machine shops, stove and range factories, boat and canoe works, sash and door factories, fibre board works, brickyards, etc. It is acquiring a wide repute as a summer resort. Pop. 3,568.

PENFIELD, Edward, American artist: b. New York, 2 July 1866. He was educated at the Art Students' League, New York, and subsequently studied in England and Holland. From 1891 to 1907 Mr. Penfield was art editor of the Harper magazines. He now devotes his time exclusively to illustrating, designing and painting. Mr. Penfield was the originator of the poster in America, and used numerous «textures» in reproducing his drawings that were not attempted before in relief printing from zinc or other plates. He designed many posters for *Harper's Magazine*, and posters and designs for various purposes and illustrated a number of magazine articles in color. He executed decorations for the breakfast room of Randolph Hall, Cambridge, Mass., also decorations for the Rochester Country Club. He published ‹Holland Sketches› (1907), and ‹Spanish Sketches› (1911).

PENFIELD, Frederic Courtland, American diplomat: b. Connecticut, 23 April 1855. He studied in Germany and England, and then entered journalism and was for five years on the editorial staff of the Hartford *Courant*. In 1885 he was appointed United States vice-counsul-general at London, and in 1893–97 served as diplomatic agent and consul-general to Egypt, with the rank of minister-resident. In 1913 he was sent as United States Ambassador to Austria-Hungary, where he remained until diplomatic relations between the two countries were severed in 1917. He acted as special representative of President Wilson at the funeral of Emperor Francis Joseph in Austria. He has traveled extensively in India, China and Japan and has been honored by various foreign societies. He has received decorations of the highest class from governments of France, Turkey, Serbia and Egypt and from the Pope. He has published 'Present Day Egypt' (1899); 'Mahmoud Pasha' (1903); 'East of Suez' (1907); and numberless articles on international and economic subjects in the leading reviews and periodicals.

PENFIELD, Samuel Lewis, American mineralogist: b. Catskill, N. Y., 16 Jan. 1856; d. South Woodstock, Conn., 12 Aug. 1906. He studied abroad, at Strassburg and Heidelberg. He was graduated from the Sheffield School at Yale in 1877, and became professor of mineralogy there. He was a member of the National Academy of Science, and was from 1877 an extensive contributor on the subjects of mineralogy, crystallography and chemistry in the *American Journal of Science and Art.* He was a leading authority on mineralogy. He published 'Brush-Penfield Determinative Mineralogy and Blow-Pipe Analysis' (1898), and was joint author with L. V. Pirsson of 'Contributions to Mineralogy and Petrography from the Sheffield Scientific School' (1901).

PENFIELD, William Lawrence, American lawyer: b. Dover, Lenawee County, Mich., 2 April 1846; d. 9 May 1909. He was graduated from the University of Michigan in 1870, whence he went to Adrian College as instructor in German and Latin. In 1872 he was admitted to the Michigan bar. He then took up the practice of law in Auburn, Ind., and in 1876 became city attorney. In 1884 he was a member of the Republican State committee; in 1888 presidential elector and electoral messenger and delegate to the National convention in 1892. He was judge of the Fifth Circuit Court of Indiana 1894–97 and in the last-named year was appointed Solicitor of the United States Department of State, where he served till 1905. He was counsel for the United States in international arbitration cases of the United States against San Domingo, Peru, Haiti, Nicaragua, Guatemala and Salvador, securing awards for the United States which amounted to over $2,000,000. He was also appointed to represent the United States before The Hague permanent arbitration court in the controversy with Mexico over the "Pious Fund Claim of the Californias," this being the first case to be tried before this tribunal. He was counsel for the United States and for Venezuela in the Venezuela arbitration case at The Hague in 1903. In 1905 he was sent as a special commissioner to Brazil. In 1907 he acted as diplomatic agent and counsel for the United States in the arbitration proceedings with Nicaragua.

PENGUIN, a name now restricted to the swimming birds forming the very distinct superorder *Impennes,* and the family *Spheniscidæ.* Their wings are inflexible paddles, destitute of quill-feathers and covered with a scaly integument or skin. Although useless as organs of flight, they are very effective aids in diving, and on land may be used after the fashion of forelimbs. Most of the swimming is done below the surface, the bird coming up at frequent intervals to breathe. The hinder toe is rudimentary, or wanting in some species, and the front toes are completely webbed. On the body the feathers are scale-like and barbless, and are distributed uniformly, without naked intervals. These birds exist in immense numbers in the Antarctic seas. They occur on the South African and South American coasts, being found in large flocks at Tierra del Fuego and on the Pacific islands, Australia and New Zealand. They are gregarious in habits. On shore penguins have the habit of standing in long, regular lines, resembling files of soldiers drawn up in military array. Owing to the very posterior position of the legs the attitude on land is erect, often with the bill pointing to the zenith. They stand from 16 to 48 inches tall and weigh up to 75 pounds. The female incubates the eggs, holding them between the thighs, and they are said to carry off the eggs in the same fashion when disturbed or alarmed. The eggs are white or greenish in color and have a very thick incrusted shell. They are conical in shape, about four inches long and three inches in diameter. The male supplies the female with food during incubation, both parents feeding the young after they are hatched. The young birds are extremely helpless and many are killed by severe and sudden storms. The nests are formed in the hollows of rocks, and the eggs are deposited on the thick layer of excrement, which, accumulating through long periods of time, constitutes the valued guano of commerce. The eggs, though of rather strong flavor, are highly esteemed by sailors as adding variety to their diet. The birds themselves are also eaten. The usual food consists of fishes, mollusks, etc. As a family the penguins represent, in the southern seas, the auks of the northern and Arctic regions. There are three principal genera: *Aptenodytes* with *A. patagonica,* the king penguin, and *A. fosteri,* the emperor penguin; *Eudyptes* with *Eudyptula minor,* the little blue penguin, and *Catarractes chrysocome,* the crested penguin; and *Spheniscus,* with *S. demersus,* the well-known Cape or jackass penguin. The penguins are regarded by naturalists as constituting one of the three great classes of birds, the ostriches forming another class and all other birds a third class. There are six genera, with 20 living species, and 30 fossil species have been recognized. Prominent among the latter is *Palæeudyptes antarcticus,* found in New Zealand. Some specimens were seven feet tall. Consult Moseley, 'A Naturalist on the Challenger'; Buller, 'Birds of New Zealand'; and the writings of Antarctic explorers.

PENHALLOW, pĕn-hŏl'ō, **Samuel,** American colonist and historian: b. Saint Mabyn, Cornwall, England, 2 July 1665; d. Portsmouth, N. H., 2 Dec. 1726. He came to New England in 1686 and finally settled in Portsmouth where he amassed a considerable property and gained much influence in government affairs. After holding several offices he was appointed a justice of the Superior Court of Judicature in 1714, and in 1717 became chief justice, which office he held until his death. His work as a historian is of much value, has been several times republished, and is considered the most authentic history of the period in existence. It was first published under the title 'Narrative of the Indian Wars of New England from 1703–1726' (1725–26). It now bears the title 'A History of the Wars of New England with the Eastern Indians.'

PENICK, Charles Clifton, American Protestant Episcopal bishop: b. Charlotte County, Va., 9 Dec. 1843; d. near Baltimore, Md., 13 April 1914. He was educated at Hampden-Sidney College, studied theology at Fairfax Seminary, Alexandria, Va. He was ordained in the Episcopal Church in 1870 and in 1877 was consecrated missionary bishop of Cape Palma, West Africa. He resigned in 1883 and has since had charge of various parishes. Bishop Penick served four years in the war between the States as sergeant of the 38th Virginia Regiment, Armstead's Brigade, Pickett's Division. He was at nearly every battle of importance fought in northern Virginia, and also at the battle of Gettysburg, and surrendered with General Lee's army at Appomattox, 9 April 1865. After his return from Africa he was very active and had several charges: Richmond, Va., Louisville, Ky., Fairmont, W. Va., his last charge being Frankfort, Ky. He was greatly interested in the welfare and upbuilding of the colored people of the South, and gave one year of his life traveling over the States and making reports to the church as to the best means of helping them. Through his influence and principally with his own money he educated and put in the ministry 11 or 12 young men.

PENINSULA CAMPAIGN OF 1862, The. A campaign against Richmond having been decided upon as the stroke which would most speedily put an end to the Southern Confederacy, a sharp difference of opinion arose between President Lincoln and General McClellan, commanding the Army of the United States, as to the most advisable route by which to make the approach to the capital. The President, sustained by some of his veteran military advisers, preferred a direct march to Manassas Junction, and thence southward, at all times keeping the army in a position covering Washington. McClellan insisted upon transporting the Army of the Potomac, 110,000 to 140,000 men, to the vicinity of Fortress Monroe and thence up the York Peninsula. The President, 8 March 1862, reluctantly yielded to the plan of campaign urged by McClellan, making the condition that a sufficient force should be left at and near Washington to insure its safety, that not more than 50,000 men should be moved to the new base until the navigation of the Potomac from Washington to Chesapeake Bay should be free from the Confederate batteries, and that the movement should begin as early as 18 March. The day after the issue of this order the Confederates evacuated their positions at Centreville and Manassas, in front of Washington, and abandoned their batteries on the Potomac. This movement changed completely the conditions under which the President had limited the number of men McClellan might take, but no change was made in that restriction. As McClellan proposed to take the field with the Army of the Potomac, he was relieved from command of all other military departments, thus isolating his expedition and leaving the command of other troops in the vicinity to Washington; a division of command which invited disaster, and, indeed, led, with other miscalculations, to the failure of the campaign. The Army of the Potomac, under the President's order, was organized into five corps: the First, General McDowell; Second, General Sumner; Third, General Heintzelman; Fourth, General Keyes; Fifth, General Banks. McClellan had nothing to say as to the appointment of these commanders. They were given their commands by the President. Banks was charged with the care of the Shenandoah Valley, the Upper Potomac, and the positions of Manassas Junction and Centreville, and General Wadsworth had command of the troops garrisoning Washington. The campaign began 17 March by the embarkation of two divisions of the Third corps, which were landed at Fortress Monroe and placed in position on the roads leading to Newport News and Yorktown. Other divisions followed, and McClellan in person reached Fortress Monroe on the afternoon of 2 April. The force actually transported was Sumner's, Heintzelman's and Keyes' commands, with a few thousand of regulars — infantry and cavalry — and 2,700 reserve artillery; in all, a total of 109,419 men, 14,502 horses and mules and 44 batteries with 343 guns. The fleet occupied in this transport was upward of 400 vessels.

On the 4th the movement began, Heintzelman's corps on Yorktown, Keyes' on its left. On the morning of the 6th Heintzelman was stopped by the Confederate works at Yorktown, and on the left Keyes was checked by a small battery on the line of Warwick River. The Confederates, under Gen. J. B. Magruder, held a line across the Peninsula from the mouths of the Warwick River and Deep Creek, on James River, to Yorktown, on York River. The line, about 12 miles in length, was covered a great part of the distance by boggy and difficult swamps, and quite well fortified by redoubts at the road crossings and a series of dams which had been raised to flood the swamps. The entire opposing force was (4 April) 11,000 men, of which about 6,000 were at Yorktown and Gloucester Point on the opposite bank of the York River, leaving but 5,000 to cover the remaining 11 miles. A part of McClellan's plan was that the navy should reduce Yorktown from the river, but no orders were issued to the navy to co-operate. The existence of this Warwick River line was a surprise to McClellan, who knew that Yorktown was fortified, but had no knowledge of the defensive works extending from that place to the James, and his movement on Yorktown was predicated on the belief that he could turn it by his left. Keyes' force of 25,000 men was, therefore, halted in the face of the unknown opposition while a movement was made against Yorktown. It was a part of McClellan's plan, also, that McDowell's corps should turn Yorktown by the right, by landing at Gloucester Point on the north bank of York River, but on the 5th he was notified by the adjutant-general of the army that McDowell had been withheld from his control to defend Washington, as it was claimed that McClellan had not complied with the President's condition to make Washington secure, and McDowell was necessary to that security. McClellan protested and urged that at least McCall's and Franklin's divisions of McDowell's corps should be sent him, and a few days later the President ordered Franklin's division to report to him, which it did on the 20th. Meanwhile McClellan had begun a regular siege of Yorktown, and apparently gave up all idea of breaking the Warwick line at any point, though strongly urged by the President to do so. He reconnoitered the line and, 16 April, had an engagement at Lee's Mill (q.v.), which only the more strongly confirmed him in the prosecution of a regular scientific siege. A month was spent in preparation. Batteries were constructed and 90 heavy guns put in position. (See YORKTOWN, SIEGE OF). But McClellan's plans had leaked into the possession of the enemy, and just as he was about to open fire on the morning of 4 May, it was discovered that during the day and night preceding the Confederates had abandoned the place very deliberately and marched for Williamsburg and Richmond, leaving a booty of 71 guns of various calibres to pay McClellan for a month's arduous toil of a whole army. McClellan started in pursuit, but not until noon did his troops get on the road, McClellan remaining at Yorktown to superintend the loading of Franklin's division on transports for the purpose of ascending York River, to land opposite West Point, and attack the Confederates in flank. The Confederate rear-guard was overtaken by the Union advance at Williamsburg, and a severe engagement ensued on the 5th, in which the Confederates' loss was 3,000 killed and wounded and 600 prisoners. The Federal loss was 2,073 killed and wounded and 623 taken prisoners.

Franklin did not get off from Yorktown until the 6th, reaching Eltham Landing above West Point, at 1 P.M., where he disembarked his troops and awaited orders. The greater part of the Confederate army was already beyond striking distance, but to protect its trains, a division attacked Franklin on the morning of the 7th and engaged him until 3 P.M., when it withdrew. Stoneman's cavalry opened communication with Franklin at Eltham's Landing, and the Army of the Potomac marched from Williamsburg on the 8th, passing through Barhamsville, Roper's Church and New Kent Court House, headquarters being established at Cumberland, on the south bank of the Pamunkey, on the 15th, and on the 16th at White House, where a permanent depot was organized. Gen. Joseph E. Johnston, commanding the Confederate army, since 17 April, had halted but 22 miles from Williamsburg until 15 May, when, hearing that the *Merrimac* had been destroyed and James River opened to the Union gunboats as far as Drewry's Bluff, he crossed the Chickahominy, and on the 17th encamped his army about three miles from Richmond. At McClellan's request the President ordered an expedition up James River, which was halted at Fort Darling by the Confederate ironclad *Virginia,* formerly the *Merrimac,* and the shore batteries, and Commodore Rodgers suggested to McClellan a land expedition to co-operate with the navy in the capture of that work, but McClellan preferred to delay the matter until after he should have crossed the Chickahominy. Meanwhile, by taking from Sumner, Heintzelman and Keyes each a division, McClellan had organized two additional corps and given command of them to Generals Fitz-John Porter and Franklin. On the 21st his army was drawn up along the north bank of the Chickahominy, facing Richmond. which was but 7 to 12 miles distant. Soon after the battle of Williamsburg (q.v.) McClellan's call for reinforcements became earnest and persistent; he reported that he had not more than 80,000 fighting men, and that the enemy had many more. The President finally consented to send McDowell overland from Fredericksburg, with 40,000 men and 100 guns, to co-operate with McClellan by coming in on his right, but in no case to uncover Washington. McDowell was to have marched on 26 May, and to clear his way McClellan ordered Gen. Fitz-John Porter, with about 12,000 men, to drive from the vicinity of Hanover Court House, 14 miles north of Richmond, a considerable body of the enemy, under Generals Anderson and Branch, and to destroy the bridges over the South Anna and Pamunkey rivers and cut the railroad connecting Richmond directly with northern Virginia. Porter started from New Bridge on the Chickahominy on the morning of the 27th, with a division of infantry and some regular cavalry and artillery. At the same time Col. G. K. Warren, with a brigade moved from Old Church on a road running parallel to the Pamunkey. Porter engaged and defeated Branch at Hanover Court House (q.v.), destroyed some of the bridges on the railroad and returned to his old camps. But McDowell did not join McClellan. When his head of column had marched but a short distance out of Fredericksburg his entire movement southward was suspended by orders from Washington, and he was sent westward against «Stonewall» Jackson in the Shenandoah Valley (q.v.). Meanwhile the corps of Keyes and Heintzelman had crossed the Chickahominy, Keyes' advance taking position at Seven Pines, on the main road leading to Richmond, about five miles from the city. Heintzelman was in rear, and the three corps of Sumner, Franklin and Porter were on the north bank of the Chickahominy, forming almost a semi-circle concave to the Confederates. On 31 May McClellan reported a strength of 126,089 officers and men present, with 280 field guns. At the same time the Confederate army defending Richmond numbered about 58,000 men. Johnston, with about 32,000 of these, attacked the 19,000 of the two Union corps south of the Chickahominy on the 31st, driving them back some distance, when he was checked by Sumner, who had hurriedly crossed the Chickahominy and struck his left. During the closing hours of the engagement Johnston was severely wounded, and Gen. G. W. Smith succeeded to his command. On the morning of 1 June the battle was renewed, and it ended with the success of the Union troops, who gained the ground lost the previous day. This battle is known as that of Fair Oaks or Seven Pines (q.v.). The Confederate loss was 4,500 and the Union loss 5,700. During this action McClellan had 50,000 men inactive at Cold Harbor, but feared to move them lest his right flank be turned by a force whose strength he did not know. At noon of 1 June Gen. R. E. Lee assumed command of the Confederate army, and at night he ordered its withdrawal to the camps near Richmond, which was done by daybreak next day.

The country was now drenched with torrential rains and great freshets followed carrying away all the bridges, which the Union army was compelled to rebuild. For nearly a month both armies remained inactive, each strengthening its position, General Lee bringing up troops from every possible quarter until late in June, when, including Jackson's command, he had 80,762 men. McClellan had received McCall's division of McDowell's corps as a reinforcement, and had 92,500 men. On 25 June Porter was on the right of the line, north of the Chickahominy, the four corps of Franklin, Sumner, Heintzelman and Keyes south of it, and on that day, preparatory to a general movement on Richmond, an advance was made in front of Seven Pines, which brought on the battle of Oak Grove (q.v.), with no material result; but it marked the beginning of the «Seven-days' Battles» (q.v.). «Stonewall» Jackson had now been brought from the Shenandoah Valley, and 26 June Lee crossed the Chickahominy with the greater part of his army to turn McClellan's right, cut him off from his base at White House and force him to retreat down the peninsula. Lee attacked McCall's division at Mechanicsville or Beaver Dam Creek (see MECHANICSVILLE, BATTLE OF), and was signally defeated. On the 27th McCall fell back, and Lee, advancing and joined by Jackson, fell upon Porter's corps at Gaines Mill (q.v.), inflicting upon it and Slocum's division of Franklin's corps a bloody defeat. The Federals lost 7,000 killed and wounded and the Confederates many more, but the latter had been victorious. That night McClellan came to a determination, which he had had under consideration, to retreat to James River; his trains were put on the road to cross White Oak Swamp, and move to Haxall's Landing, and Porter's corps recrossed to the south side of the Chickahominy and followed. The bridges across the Chickahominy were destroyed. Fortunately for McClellan General Lee did not correctly understand his movement on the 28th, and he withdrew his right, under cover of his left, which remained in the works fronting Richmond, preventing General Magruder from getting any knowledge of what was going on. Late in the afternoon and night of the 28th Lee came to the conclusion that McClellan was retreating to James River, but gave no order for pursuit until the morning of the 29th, when Longstreet, A. P. Hill, D. H. Hill and Jackson were ordered to recross to the south side of the Chickahominy, and General Magruder, who discovered by sunrise that the works in his front had been abandoned by Sumner and Heintzelman, was ordered to pursue by the Williamsburg road, and General Huger by the Charles City road. At 9 A.M. Magruder overtook Sumner at Peach Orchard or Allen's Farm (q.v.), and a battle resulted, in which Magruder was checked, and after which Sumner fell back to Savage Station (q.v.), where he was again attacked by Magruder late in the afternoon. He held ground until dark, when he fell back across White Oak Swamp, and with Franklin and Heintzelman prepared to dispute the Confederate advance. Lee now concentrated for a heavy blow to cut McClellan's army in two and destroy it. He threw his divisions upon Sumner, Franklin and Heintzelman on the 30th, at Glendale (q.v.), but was unsuccessful. Next morning (1 July) the Army of the Potomac was in position at Malvern Hill, on the James. Lee followed, and in the afternoon attacked and was repulsed with great loss. McClellan was urged to retreat no farther, but he abandoned Malvern Hill during the night and by morning of 2 July his head of column was at Harrison's Landing. The Confederates did not come up to his position until the morning of the 4th. Lee thought it not judicious to make an attack, and on the 8th marched the main body of his army back to the vicinity of Richmond, and the Peninsula Campaign was ended. The Union loss in the campaign was 16,600 killed and wounded and 7,500 captured or missing. The Confederate loss was 27,000 killed and wounded and 2,000 captured or missing. In both armies the sick-list was very large and many died. Consult 'Official Records' (Vol. XI); 'McClellan's Own Story' (New York 1887); Michie, P. S., 'Life of McClellan' (New York 1901); Webb, 'The Peninsula'; Swinton, 'The Army of the Potomac'; Barnard, J. E., 'The Peninsula Campaign' (New York 1864); Compte de Paris, 'History of the Civil War,' Vol. II; Walker, 'History of the Second Army Corps'; Powell, 'History of the Fifth Army Corps'; Fitzhugh Lee, 'Life of Gen. Lee'; Allan, 'History of the Army of Northern Virginia'; 'The Century Company's 'Battles and Leaders of the Civil War' (Vol. II).

E. A. CARMAN.

PENINSULAR STATE, a name applied to Florida on account of its geographical outline.

PENINSULAR WAR, The, sometimes called the War of Spanish (or Portuguese) Independence, a series of important campaigns 1808–13, against Napoleon in the Iberian peninsula, his opponents being the English, Spanish and Portuguese. Canning was a firm believer in the utilization of aroused national feeling against Napoleon in states invaded by the French. Such a feeling had sprung up in Spain in 1808, when Ferdinand, Prince of Asturias, having received the crown of Spain by the abdication of Charles IV, his father, ceded it to Napoleon, who gave it to Joseph Bonaparte 6 June 1808. In spite of brave opposition, the French king entered Madrid 14 July; but six days later three French divisions were forced to surrender, guerrilla warfare increased in force, and Spain showed the first successful national resistance to Napoleon. But before this, by the aid of Charles IV, when he was still king of Spain, a French army under Junot had entered Portugal, and a Portuguese rising followed that in Spain. The provisional government of the insurgents asked help from England, so that, at the close of the year 1808, the future Duke of Wellington had defeated the French at Roriça and at Vimeiro 21 August. Junot by the Convention of Cintra, 30 August, had promised to evacuate Portugal; and, in fine, Canning's policy had proved successful enough to justify itself thoroughly. The campaign in Spain in 1809 was opened by Napoleon himself at Madrid, and all looked gloomy for Spain until July, when Wellington, having dislodged from Portugal a fresh French army under Soult, invaded Spain and won the victory of Talavera de la Reina, 28 July, which effected little because of inadequate support in the field and at home so that the latter part of the year, like the former, was a monotonous series of French successes over untrained Spanish troops. The third year of the war (1810) was taken up by the attempts of the French armies to complete their conquest of Spain and to drive Wellington from his fortifications at Torres Vedras; but Masséna was forced early in 1811 to retire from Portugal to Spain. He was pursued and defeated by Wellington at Fuentes de Onoro 5 May 1811. On 16 May Portugal was again emptied of French troops by Beresford's victory over Soult at Albuera. In central Spain the French suffered from guerrilla attacks and only in the east, where Suchet controlled Valencia and Aragon, were they successful. In 1812, the year that saw the grand army wrecked in Russia, Wellington completely defeated Marmont at Salamanca 22 July, and Joseph Bonaparte left Madrid, which was occupied by the English 12 August. However, the French held Burgos, and Suchet was still invincible. But the French armies in Spain were weakened by the demands of the German campaign of 1813. Wellington broke communications with Paris, at Vitoria, 21 June, defeated Jourdan — a victory which left Suchet entirely unprotected and forced him to retire — and 31 August stormed San Sebastian, thus breaking the last vestige of French power in Spain and making his way into France itself. There he was equally successful at Saint Palais 15 February, and at Vic-en-Bigorre 19 February, and was still manœuvring against Suchet when word came of Napoleon's abdication. Consult Napier, W. F. P., 'History of the War in the Peninsula' (London 1828–40); Arteche y Moro, 'Guerra de la independencia' (1868–1901); Shand, A. I., 'The War in the Peninsula' (New York 1898); and Oman, C. W. C., 'History of the Peninsular War' (Oxford 1902).

PENITENTIAL PSALMS, seven psalms in which repentance is expressed and pardon asked of God. In the Authorized Version they are: 6, 32 (Latin numeration 31), 38 (L. N. 37), 51 (L. N. 50), 102 (L. N. 101), 130 (L. N. 129), and 143 (L. N. 142). In the Roman Catholic Church they are used on solemn occasions, and Pope Innocent III (1198–1216) ordered their recitation in Lent. Pius V (1566–72) appointed the Fridays in Lent as proper days for this exercise. We are told that Saint Augustine when he was dying caused these Psalms to be written out on the wall facing his bed, and their classification and name are of great antiquity. In the Anglican Church they are appointed to be used in the services for Ash Wednesday, the Prayer Book direction to that effect having been inserted in the revision of 1662. The most deeply penitential and the most frequently in use is the 51st Psalm, known also as the Miserere.

PENITENTIARY, a word employed in the early Church to designate the priest or presbyter whose office was to receive the private confessions of the people, and to advise as to whether public or private penance was demanded by the heinousness of the offense. The penitentiary had no power to impose penances. The office was abolished in the East by Nectarius, patriarch of Constantinople, during the reign of Theodosius. It still exists in the Roman Catholic Church where penitentiaries are of varied rank. The cardinal grand penitentiary presides over tribunal of penitentiaries at Rome, as a sort of chief justice of the ecclesiastical supreme court. Penitentiary priests are special ecclesiastical officers appointed by the Pope to hear confessions in the three patriarchal churches, of the Vatican, the Lateran and Santa Maria Maggiore. The Council of Trent decreed that every bishop should establish in his cathedral church a penitentiary priest who must be either a doctor, master or licentiate in theology or canon law and not under 40 years of age. His office is to consider and determine especially cases of absolution or dispensation referred to him.

PENITENTIARY, a prison. See PENOLOGY.

PENJAMO, pān'hä-mō, Mexico, town in the state of Guanajuato, 35 miles northeast of the Valle de Santiago, in a fertile and well-watered valley on the right of the Rio de Leon and within four miles of the Queretaro-Guadalajara railroads. The birthplace of the Mexican patriot Miguel Hidalgo y Costilla is in the nearby village of Dolores Hidalgo. Pop. about 9,000.

PENJDEH, pĕnj'dă, Turkestan, the name of an oasis in lat. 36° 4' north, long. 62° 41' east, the seat of a Turcoman camp, 130 miles north of Herat. It is of irregular form, about 27 miles in extreme length and 20 miles in extreme breadth and has an area of about 300 square miles. It belonged to Afghanistan until 1885. Its importance is derived from its location in the long-disputed boundary region between the English and Russian spheres of influence. Its seizure by the Russians on 30 March 1885 led to elaborate preparations for war; but after various conferences a treaty was arranged in 1887 by which the Russians were allowed to remain in possession. On the breaking up of the Russian Empire in 1917 Penjdeh was lost to Russia. The people keep large flocks, and are expert in the manufacture of cloth and carpets. Pop. about 117,000.

PENN, John, American colonial governor of Pennsylvania, grandson of William Penn (q.v.): b. London, England, 14 July 1729; d. Philadelphia, Pa., 10 Feb. 1795. He was educated in the University at Geneva, came to Philadelphia in 1753, and served in the provincial council as its First Member until after Braddock's defeat, when he left the colony, going back to England, where he remained eight years. He returned as lieutenant-governor in 1763, and his administration was much disturbed by troubles with the Indians, with whom he finally succeeded in forming the treaty of Fort Stanwix in 1768. He was absent in England in 1771–73, but returned with full power as governor, and during the early portion of the Revolutionary period endeavored to steer a middle course, but in 1775 his council was supplanted by the committee of safety. His loyalty being questioned, he was imprisoned for a time in 1777–78, but was released after a few months; however, with the other members of the Penn family, he was stripped of all his proprietary rights, receiving a share of the £130,000 allowed by the legislature for lands transferred to the possession of the State. He also received one-fourth of the annuity of £4,000 which the British government granted to the family. Consult 'Pennsylvania Archives'; Sheperd, 'Proprietory Government in Pennsylvania.'

PENN, John, American statesman: b. Caroline County, Va., 17 May 1741; d. North Carolina, September 1788. He studied law, was admitted to the bar in 1762 and became a successful practitioner, attaining a reputation for eloquence and ability. In 1774 he removed to Greenville County, N. C., and in 1775 was elected to the Continental Congress, where he signed the Declaration of Independence in 1776. He was re-elected for the term 1778–80, and upon the invasion of Lord Cornwallis Penn was placed in charge of the affairs of the State with power nearly that of a dictator; he performed the difficult duties of his trust with much credit, and in 1784 was made receiver of taxes for North Carolina. This office he resigned after a month, and retired to private life.

PENN, Richard, English colonial governor of Pennsylvania, grandson of William Penn: b. England, 1735; d. Richmond, Surrey, England, 27 May 1811. He was educated at Saint John's College, Cambridge, accompanied his brother, John Penn (q.v.), on his return to Pennsylvania in 1763, and in 1764 became a member of the Provincial Congress. He went back to England in 1769, but came again to America to act as deputy-governor in 1771–73, during his brother's absence in England. At the outbreak of the Revolution he sympathized openly with the colonists, among whom he was very popular, and in 1775 acted as the messenger of Congress to England with a petition for various concessions. He did not return to America for many years and then only for a brief visit in 1808. From 1784–1808 he sat in Parliament, after which he retired to private life. His wife, Mary, whom he married in 1775, was a daughter of William Masters of Philadelphia.

PENN, Thomas, English colonial proprietor in America, son of William Penn: b. London, England, 8 March 1702; d. at Stoke Poges, 21 March 1775. He was invested with power of attorney by his brothers John and Richard, and came to Pennsylvania in 1732 to look after the interests of their immense estate. He was a member of the provincial council and remained in the colony until 1741. When the disputes concerning boundaries and taxation were settled Thomas and his brother Richard (John having bequeathed his interest to the former on his death in 1746), were in possession of a feudal estate of 25,000,000 acres with over 200,000 inhabitants, which was exempt from taxation. This condition led eventually to the commissioning of Benjamin Franklin in 1757 to present to Thomas Penn, then in England, a protest known historically as the «Heads of Complaint.» In 1760 the long litigation between Thomas and his brother Richard on one side and Lord Baltimore on the other was definitely settled. (See PENN v. BALTIMORE). Upon the seizure of the great estates of the Penn family by the State in 1775 Thomas Penn received three-fourths of the State's award of £130,000 for the lands taken. He is reputed to have been one of the founders and a chief supporter of the College of Philadelphia, which afterward became a part of the University of Pennsylvania.

PENN, SIR William, English admiral: b. Bristol, England, 1621; d. Wanstead, Essex, England, 16 Sept. 1670. He early entered the navy and served with rapid promotion. In 1648 he was made rear-admiral and in 1649 captain and vice-admiral of the Irish fleet. In 1652 he was appointed to the same office in the fleet under Admiral Robert Blake. To him was due, in a great measure, the victory of Portsmouth in February 1653. On 2 Dec. 1652 he was appointed general of the fleet. At the termination of the war with Holland, Penn determined to desert Cromwell, and accordingly offered his allegiance and his fleet to the Stuarts. Charles could not then dispose of the fleet and advised him to continue in the service of the Commonwealth until an opportunity favorable to their plans should arise. In 1654 he was appointed general and commander-in-chief of the expedition which in 1655 wrested Jamaica from the Spaniards, and on his return was imprisoned in the Tower, ostensibly on the charge of having absented himself from his duty without leave, but really because his relations with Charles had been discovered. Upon his release a few weeks later he retired to his estate in Munster and there remained until the eve of the Restoration. In 1660 he was knighted and made a commissioner in the navy; his possession of certain Irish estates was confirmed by the king in 1665 and in that year as Great-Captain-Commander under the Duke of York he won the victory over the Dutch off Lowestoft. He held no further command afloat, but was connected with the naval office until his death.

PENN, William, founder of Pennsylvania: b. London, 14 Oct. 1644; d. Ruscombe, Berkshire, 30 July 1718. His father was Vice-Admiral Sir William Penn, who had a remarkably successful career in the British navy. His mother was Margaret Jasper, the daughter of a wealthy merchant of Rotterdam. While the admiral was off on the seas, his wife and little boy resided on one of his estates at Wanstead in Essex. William Penn went to school at Chigwell, nearby, where he was apparently under influences largely Puritan. At the age of 11 a strong religious conviction came suddenly upon him. «He had the strongest conviction of the being of a God and that the soul of man was capable of enjoying communication with him,» an experience which profoundly influenced his future life. In 1656 the family removed to Ireland, and here young Penn was given the best of private instruction.

His boyhood days were lived during the Protectorate. The Admiral, after receiving honors and riches from Cromwell, had so timed his change of loyalty as to gather in a good share of the rewards distributed at the time of the Restoration. He was in a condition to send his son to the most aristocratic of Oxford Colleges, and at the age of nearly 16, in the year 1660, William Penn became a «Gentleman-Commoner of Christ Church.» The boy was evidently tinged with puritanism; the prayer-book and the surplice savored of papacy, and he joined a little company of students in religious worship not authorized by the Established Church. An Oxford Quaker, Thomas Loe, spoke with power in the city and Penn came under his influence. The results were not exactly Quakerly, however, for in company with a friend, he forcibly tore from the backs of fellow-students the «popish rags,» as surplices were called by the zealous puritans of the day.

WILLIAM PENN

For this he was, with others, expelled from the college. He went to his home and announced himself a Quaker. He was now a manly youth of 18, handsome in appearance, and of unusual intelligence. His father had intended him for a high career in the state, and no news could have been more unwelcome than this. True to his convictions, he adopted the speech and manners of the sect and attended their meetings. Exile from home followed, but this simply aroused his determination. His father's friends interceded for him, pointing out that one might rather be proud of a son who eschewed the frivolity and immorality of fashionable society of the days of Charles II. He was sent abroad in the company of persons of high degree, first to Paris, where he entered partially into the circle of fashion; thence to Saumur, the Protestant college, where he laid the foundation of that extensive knowledge of patristic literature so much in evidence in his future writings; thence touring in Italy, where he received a letter from his father calling him home in 1664. The trip had produced its designed effect and the signs of the Quaker had disappeared.

He was then entered as a student at law at Lincoln's Inn, and was given a place on his father's staff. In 1666 he was sent by his father to manage his large Irish estates. He joined the expedition to put down a mutiny in the garrison at Carrickfergus, and procured for himself a suit of armor, in which seems to have been painted the only picture of him made during his lifetime. The picture shows a handsome youth, with hair parted in the middle and long dark locks. His martial ardor was of short duration. Thomas Loe again crossed his path in Cork and Penn became a Quaker never more to falter. He was soon imprisoned with his fellows on a charge of rioting, and this was but the beginning of many and severe confinements which lasted at intervals through his life. His influence soon secured his release. His father was angered by his «thee» and «thou,» which the Quakers had adopted as the language of equality, and his refusal to doff the hat, then a symbol of reverence of worship, and drove him from his house. In time they were reconciled and the Admiral on his deathbed in 1670 endorsed the course of his son.

Penn began immediately to preach and to enter into the theological controversy of his time. His supposed unsoundness on the Calvinistic interpretations of the day got him into the Tower. «My prison shall be my grave,» he said to the Bishop of London, who asked him to recant as the price of liberty, «before I will budge a jot. For I owe obedience of the Conscience to no mortal man.» He was soon discharged due to the influence of the Duke of York, afterward James II, with whom he enjoyed a strong friendship. 'Truth Exalted,' in 1668, was his first important publication; then followed, in the same year, 'The Sandy Foundation Shaken,' 'Innocency with her open Face,' and the most noted and valuable of his works, a book breathing the noblest spirit of Christianity, written in prison, 'No Cross, No Crown.'

In 1670 he was again arrested under the Conventicle Acts. His trial is noted in the records of English jurisprudence. With a friend, William Mead, they were brought before the Court, upon an illegal indictment and insufficient evidence. Penn conducted the defense and the jury brought in a verdict of *not guilty*. The judge was infuriated and endeavored to browbeat them into another decision, when Penn appeared as their champion, and so enheartened them by his exhortations to firmness that they stood their ground and settled for all time the independence of juries within their proper limitations. His next important work, 'A Seasonable Caveat against Popery' (1670), brought out a principle, further elaborated in 'Great Case of Liberty of Conscience' (1671), which now became one of his guiding standards of life, universal toleration, which soon developed into perfect religious liberty. The last work was written in prison. On his release he made a trip to Holland and Germany, preaching the gospel.

He took advantage of a little surcease from jails to marry, in his 28th year, Gulielma Maria Springett, daughter of Sir William Springett, a woman of great beauty and sweetness. A declaration of indulgence for dissenters issued by Charles II, in 1672, now made his life easier, and with an estate of £1,500 a year left him by his father, he settled at Rickmansworth, in Hertfordshire. He was active for a few years in preaching his doctrine through England by tongue and pen. The indulgence was soon revoked and Penn began the work in which we find him engaged largely through life, of securing releases, by his influence at court, for his suffering friends. In 1675 he wrote a 'Treatise on Oaths,' explaining why Quakers refused to take them. Another soon followed, 'England's Present Interests Considered,' a work devoted to showing the history and progress of civil liberty in the kingdom.

In 1675 his thoughts were first seriously turned to America. Lord Berkeley and Sir George Carteret, who had received from the Duke of York the promise of New Jersey, sold the western half to two Quakers, John Fenwick and Edward Byllinge. They had some difficulty between themselves in the settlement of their relative claims and asked William Penn to arbitrate the matter. Byllinge afterward becoming embarrased, transferred to Penn and two others his interest for the benefit of the creditors. West New Jersey was opened for sale and the persecuted Quakers found there a haven of rest. Penn wrote to Richard Hartshorne, a settler whom he appointed his agent, «We lay a foundation for after ages to understand their liberty as men and Christians, that they may not be brought in bondage but by their own consent; for we put the power in the people.» The colony prospered greatly under the management of Penn and his friends. In 1677 he established his family in Worminghurst, in Sussex, on an estate owned by his wife. In company with George Fox, Robert Barclay and others, Penn paid a religious visit to Holland and Germany. Here he made a convert of the Princess Elizabeth Palatine, granddaughter of James I, a woman of great intelligence, learning and spirituality, who became a devoted adherent and correspondent. More important, historically, however, he began that acquaintance with the Rhine Valley which resulted in a great emigration of its inhabitants to Pennsylvania, in the following century. His journal of the trip is among his printed works. When he returned he found persecution breaking out anew, many of his friends in jail and their estates confiscated. The plea was that the Papists were intended to be the sufferers and the Quakers were drawn in incidentally. Penn published a plea for liberty, even for Papists — a sentiment which, in that day, required no small courage — and gave rise to a report, from which he afterward suffered greatly, that he was a Jesuit in disguise. In 1679 he wrote an 'Address to Protestants of all Persuasions' to promote general morality, also an address to William, Prince of Orange, on behalf of certain dissenters in Holland. He also became interested in political affairs, identified himself with the Whig party and worked in behalf of the Parliamentary candidacy of the republican Algernon Sidney. He enjoyed great favor at court. His rank, wealth, courteous manners and strong personality gave him much influence, while his Quaker customs and speech seem to have been regarded with good-natured tolerance. This influence he continually exerted for the aid of his suffering brethren and his advocacy of his favorite doctrine of universal toleration. The rest of the life of Penn belongs largely to the history of Pennsylvania. Before entering on this it is well to mention a few of the principal writings of the following years. 'Examination of Liberty Spiritual' appeared in 1681; 'Persuasive to Moderation,' in 1686; 'Fruits of Solitude,' in 1692, being a perfect treasury of wise advice, so that it has recently sprung into fresh popularity and many editions in England and in America, having been a favorite of Robert Louis Stevenson; and about the same time a comprehensive 'Essay towards the Present and Future Peace of Europe,' being a suggestion for an international parliament which has been the basis of a movement culminating in the Hague tribunal; 'Rise and Progress of the People Called Quakers,' in 1695; 'Primitive Christianity Revived,' in 1696. His preaching whether in England or America was incessant. His influence at court, strong under Charles II, was ascendant under James II, suffered an eclipse under William and Mary, and recovered itself under Anne.

He had inherited from his father a claim of £16,000 against Charles II for money loaned and services rendered. In 1680 he asked the payment of this claim in lands in America. The king was willing to be so easily released from a troublesome debt and to satisfy an influential friend. Penn saw an opportunity, for which his New Jersey experience had prepared him, to found a Christian commonwealth devoted to liberty, peace and justice, and to secure a place of rest for his persecuted co-religionists. The deed was signed on 4 March 1681. It made William Penn governor and proprietor of "Pennsilvania," a vast tract, intended to be three degrees in latitude and five in longitude. It was described as bounded on the east by the Delaware River, on the west by Maryland and to extend as far northward "as plantable." He could sell the land on his own terms and to whom he would. He could fix the government, make the laws — subject to the assent of the freemen — appoint magistrates and judges, levy taxes, control the military forces and grant pardons and reprieves, though in all these powers the Crown reserved a veto. He now went to work with great energy to settle his colony. A few Dutch and Swedes were already on the banks of the Delaware and some English Quakers had drifted over from West Jersey, while the Indians roamed the woods. He addressed these inhabitants, promising them, "You shall be governed by laws of your own making," and sent out his cousin, William Markham, as his deputy. The impossibility of laying out the province in accordance with the terms of the royal grant became manifest as soon as a few latitudes were taken and the long controversy between Penn and Lord Baltimore, continued by their heirs, was not settled for nearly a century. It interfered sadly with Penn's plans for living in his province, and produced bickerings and hard feeling, at times verging on war.

He pushed sales with vigor and immediately the colonists began to arrive. But the subject on which his heart was most set was the "Frame of Government." His first "frame" was extreme republicanism. He abolished primogeniture, gave all the power to the people to initiate the repeal laws, reserving no veto for himself. All taxes were to be collected by law, the courts were to be open to all and no oaths required; penalties were to be light, capital punishment abolished except for murder (the more remarkable, as at this time, there were enumerated 200 capital offenses in the English law); prisons were to be workhouses and all children taught a useful trade. All who professed faith in Jesus Christ were to be eligible to office and all who confessed an almighty God were to have free exercise of their worship. This "frame" showed the working of Penn's mind and probably better expressed his ideas of government than those which followed. In some respects it was modified, but to the one feature of wide religious liberty he adhered with tenacity in the face of considerable opposition. He had pleaded for it in England when a member of a persecuted sect; as the ruler of a State he would be true to his ideals. Leaving behind a beautiful letter to his wife and children, which has been extensively published, he sailed with about 100 others, most of whom were Quakers, for America. On 27 Oct. 1682 he landed at New Castle. This was also his territory, for the Duke of York had transferred to him the land of the present State of Delaware. Stopping at Chester, he went leisurely up the river to the new city which he had named Philadelphia, then partly laid out, and the scene of great building activity.

The celebrated treaty with the Indians was probably made in the summer or fall of 1683. Penn was continually meeting tribes, buying land and cementing friendships. His fairness and liberality won their hearts. At various times he bought all of southeastern Pennsylvania, in sections stretching from "creek" to "creek" and running up into the country a distance measured by the length of one or two days' walk. One of these treaties was held at Shackamaxon (now Kensington) and has been immortalized by West on canvas and Voltaire in print. Penn spent nearly two years in Pennsylvania. He met legislatures and preached in the Quaker meetings, sold land in the country and developed his city, settled disputes and established courts, and hospitably entertained white and red men. The claims of Maryland were being pressed in London and on 12 Aug. 1684 he embarked for England, expecting to make a brief stay and to bring his family permanently to Pennsylvania.

James II, the great friend of Penn and his father, came to the throne shortly after his arrival and Penn strove to use his influence for persecuted dissenters. As this would embrace Roman Catholics, James at first assented and 1,400 imprisoned Quakers were set free; but political measures demanded the re-enactment of the offending measures and Penn became a courtly intercessor for all sorts of favors. This lasted till the revolution of 1688, except for a second visit to Holland and Germany on a diplomatic mission for James, which Penn turned to religious advantage also, preaching everywhere. From this trip sprang the great emigration of Germans into the Penn province during the early 18th century. Upon the accession of William and Mary, conditions radically changed. All friends of the Stuarts were suspects. Twice Penn was arrested on charges of treasonable correspondence with the banished king and twice acquitted. After each release he began to make preparations to return to Pennsylvania, where his presence was greatly needed to compose the factional differences which had arisen. On his return from the funeral of George Fox, in 1600, he heard that he had been accused again by one Fuller, whom the Parliament afterward pronounced «a cheat,» and that a warrant was out against him. He might have gone to America, but he would not under suspicion. He allowed the vessel to sail without him and went into hiding in London. This condition lasted about three years. Various treatises issued from his pen. His friends found him to converse and his opponents to argue theological points, but technically he could not be found by the king's officers. Finally, in 1693, three lords presented his case to King William, giving the assurance that there were no real charges against him. An examination was had and Penn was set at liberty. In the meantime his wife had died. The province and the territories, as Pennsylvania and Delaware were respectively called, were demanding separation from each other, and an apostate Quaker named George Keith, was making an ecclesiastical and political turmoil. In 1692, to add to his other troubles, his executive authority was taken away and given to Benjamin Fletcher, governor of New York, who was totally out of sympathy with the people of the province. Upon Penn's release, his powers were returned to him. In 1696 he married Hannah Callowhill of Bristol. This event was followed by three years of undisturbed ministerial labors which drew around him great crowds of all kinds of people. Finally, on 9 Sept. 1699, he fulfilled his long delayed plan and sailed for America with his family, intending to make it his permanent home. He at first took up his residence at Philadelphia; but when in the country before he had built on his estate at Pennsbury, Bucks County, on the banks of the Delaware, a house of some size. This he now furnished with elegance and in 1700 made it his abode. It was, however, so far from Philadelphia that he found it more convenient to spend his time mainly in that city. He busied himself with affairs of State and Church and the effect of his personal force and wisdom was soon felt in a more wholesome and united feeling in the little colony. But before two years had expired a movement in England to annex all the proprietary governments to the Crown seemed to demand his presence there. Prior to his sailing he gave the colony a new constitution under which it prospered for 75 years, till the Revolution. He chartered the city of Philadelphia and its principal school, he eloquently urged the politicians to stop their petty quarrels and unite for the good of the State, and leaving his interests largely in the hands of James Logan, on the 3d of November 1701 he and his wife sailed for England, never again to see their colony. The following 10 years of Penn's life were years of turmoil and disappointment, due largely to his own failure to judge character. His appointees to the position of deputy governor, one of whom was his son, were thoroughly unsuited to the task and fomented trouble in the colony, which was fanned by an opposing leader, named David Lloyd. Except in so far as they made Penn's life miserable, they belong rather to the history of the province than to his biography. Still more serious in its personal effects was the financial difficulty incurred by his trust in a tricky steward. Claim after claim was made and allowed without investigation, until finally his whole interest in the province was mortgaged. Finally, rather than pay the fraudulent demand, he allowed himself to be taken to a debtor's prison, where he remained nine months. The matter was compromised by his friends and the claims pared down and discharged.

A little gleam of comfort came over his declining years. His colony, in 1710, came to its right mind, placed his friends in power, and showed its appreciation of his sacrifices for them. During the colonial days ever afterward his name was held in highest honor. The most serious of his financial difficulties were past, and yet his great fortune was gone. He was seriously contemplating selling his interests in Pennsylvania to the Crown, when, on 4 Oct. 1712, in the midst of a letter to Logan, a paralytic stroke came upon him, depriving him of his memory as well as his power of locomotion. His wife gave herself energetically and successfully to his business affairs. He lingered with gradually decreasing mental powers, but with a composed mind, till 1718, when on 30 July he died in his 74th year. Penn was a prolific writer and many of his essays were translated into Welsh, Dutch, Danish, French and German. A collection of his works was published in 1726, with a biography by Joseph Besse, considered the most authoritative of all. Other collections were published in 1771 and 1782. A collection of ‹Select Works,› edited (supposedly) by John Fothergill, in 3 vols., was published in London by Phillips in 1825. Consult Buell, A. C., ‹William Penn as the Founder of Two Commonwealths› (New York 1904); Clarkson, T., ‹Memoirs of the Private and Public Life of William Penn› (2 vols., Philadelphia 1813); Dixon, W. H., ‹History of William Penn, Founder of Pennsylvania› (London 1872); Fisher, J. F., ‹The True William Penn› (Philadelphia 1900); Hodges, G., ‹William Penn› (Boston 1901); Weems, J. B., ‹The Life of William Penn› (Philadelphia 1836).

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PENN COLLEGE, a coeducational institution, located in a campus of 25 acres in the northern edge of the city of Oskaloosa, Iowa, under the control of the Friends. In 1866 the Society of Friends made an agreement with the Spring Creek Union College Association by which they had a right to conduct the affairs of the college in accordance with the principles of their society, and in 1873 Spring Creek Union College became Penn College. Four collegiate courses are offered, classical, classical-biblical, scientific and philosophical, for the completion of which the degrees of A.B., B.S, and Ph.B. are conferred. There is also a school of music, a school of commerce, a school of domestic economy, and courses in biology, agriculture and manual training, as well as a preparatory department. A summer session has recently been established. The college possesses a fine art collection and a large museum. In 1918 the library contained 10,000 volumes; the grounds and buildings were valued at over $80,000; the amount of the productive funds was $272,000; the annual income $78,000. The students numbered 555, and the faculty 30.

PENN VS. BALTIMORE, in American history, a case involving the boundaries between Penn's and Lord Baltimore's land grants from the English Crown. Penn obtained a new grant in 1682 from the Duke of York, reaching into Delaware and Maryland; also a letter from the king requesting Baltimore to hasten the adjustment of the boundary. The dispute was as to the boundary line of Maryland in the peninsula between Delaware and Chesapeake Bays, and descended to the sons of Penn, Thomas and Richard, before it was settled. The case was taken to London and decided in Penn's favor. A compromise was arranged in 1732, and enforced by the Court of Chancery in 1760, in accordance with which a line was run by Mason and Dixon, fixing the boundary in 1766.

PENN YAN, pĕn yăn', N. Y., village, county-seat of Yates County; on Keuka Lake at its outlet, and on Pennsylvania and New York Central railroads, 45 miles southeast of Rochester. It was first settled in 1800, and the village was incorporated in 1833. As some of the settlers were from Pennsylvania, while others were known as «New England Yankees,» discussion arose as to the name of the village, but both parties were finally satisfied by the adoption of the present name, Penn Yan, made up from the first syllables of Pennsylvania and Yankee. It has daily steamboat connection with Hammondsport at the head of the lake, and is the trade centre of the largest grape growing region in the Eastern States. The lake outlet affords excellent water power for mechnical industries; and the manufactures include lumber, flour grape juice, fruit baskets, paper, carriages, machinery and metal manufactures. It is a shipping point for great quantities of excellent ice harvested on the lake. It is the site of the Penn Yan Academy, a public high school, founded in 1859, and free to all residents of the district, and a Roman Catholic parish school. Of recent years it has been a popular summer resort. Pop. 4,800.

PENNACOOK (pen'a-kuk) **INDIANS,** a tribe of North American Indians which in the 17th century occupied both banks of the Merrimac River in New Hampshire for some miles above and below where Concord now stands, and which was the site of their principal village. They were the most powerful and influential of the tribes which formed the Pennacook Confederacy, an association of New England tribes of the Algonquian family, who formerly resided in southern New Hampshire, northeastern Massachusetts and southern Maine. The tribes composing the Confederacy were Agawam, Wamesit, Nashua, Souhegan, Amoskeag, Pennacook proper and Winnepesaukee. The first three named were Massachusetts Indians. Other tribes were so closely affiliated with the Confederacy as to be commonly grouped with them: the Wachuset, Coosuc, Squamscot, Winnecourt, Piscataqua and Newichawanoc tribes, but these were not full members with the first named. They made numerous early treaties with the English, but later their alliances were with the French. At one time they were reported to number upward of 4,000, but by 1630 smallpox and disease had reduced this number to 2,500, and in 1674 they were counted as 1,250. Two of the Pennacook tribes, the Nashua and the Wachuset, joined in the King Philip's War of 1675, but the others remained friendly to the whites until some 200 of their number were treacherously seized by Waldron in 1676. Most of them fled to Canada, but some went westward and settled at Schaghticoke, N. Y. In 1700 the scattered remnants of the race gathered at Saint Francis in the province of Quebec, and there their descendents reside.

PENNALISM, an ancient system of tyranny exemplified in torments and impositions to which the elder students (Schoristen) in German Protestant universities used to subject the younger ones, called *Pennales* (pencases), afterward foxes, *Neovisti, cæci* (blind), *vituli* (calves), *innocentes* (guileless), *imperfecti, Galli domesticii, dominastri, etc.* This abuse was carried to a great extent; and books written 200 years ago depict its real barbarism. Whatever the pennals possessed, they had to give up to the schorists, who compelled them to do the most menial services, made laughing-stocks of them, beat and ill-treated them, and all this had to be endured without complaint for one year, when the ceremony of deposition followed. This consisted of a series of symbolical trials (knocking off horns previously put on the pennal's head, combing his hair with a rake, etc., indicating generally the purgation from impurity and consecration to an intellectual life, after which the former victim became the tyrant of the classman below him. Pennalism was an extreme development of the practice of hazing in the colleges of that day, but degenerated among German students to practices so nearly criminal that in 1661 and 1663 the German empire enacted laws against pennalism in Jena, Frankfurt, Rostock, Wittenberg, and later in Leipzig and Giessen.

PENNAMITE WARS. The three conflicts known as the Pennamite wars resulted from the very common error in Colonial times of making royal grants in England which overlapped when they came to be worked out on the ground in America. In the drawing of the charter for Connecticut by Charles II in 1662, the grant was made to include «all the lands lying west of it from sea to sea.» At that time no conception of the breadth of the continent obtained among the men who were thus laying out grants of land in the new country. In 1681 in the charter given to William Penn, the tract conveyed overlapped the "lands west" of Connecticut, by that part of Pennsylvania lying between the parallels of 41° and 42° north — nearly two-fifths of the whole Penn tract.

The people of the Connecticut colony in the prosecution of a colonization scheme sent out explorers in 1750, who traveled as far west as Ohio. The Woyomack, or as it afterward came to be called, the Wyoming Valley, with its broad fertile bottom, 21 miles long and three miles in width, watered by the beautiful Susquehanna River, received the highest commendation in their reports, and the Susquehanna Company of Hartford was formed to settle a colony there. These lands were at that time supposedly the "property" of the Indians of the Six Nations, and a delegation was sent from Connecticut to Albany, the headquarters of these Indians, to purchase their rights in the Wyoming Valley. The bargain was made, and the price of 2,000 English pounds was duly paid to the Indians. When the Susquehanna Company undertook to place a colony on these lands the settlers were attacked by emissaries of the Penn family, who were striving to hold the lands of Pennsylvania in perpetual fee, and issuing leaseholds only to would-be purchasers. This feudalism was resented by the Pennsylvania settlers, who took sides with the Connecticut settlers and fought the Penn faction. The first battle in which blood was spilled occurred in 1769, and there were several bloody conflicts up to the spring of 1771, when the Penn retainers were thoroughly beaten. This ended the first "war," and there was peace until 1774, when a force of 700 men was gathered by the Penns and sent against the Wyoming Valley settlers, who then numbered many Pennsylvanians among their landowners. The colonists met the Pennamites with about 350 and administered a decisive defeat, after many had been killed on both sides. And thus ended the second Pennamite War. Following the conclusion of the Revolutionary War and the organization of the several States, Congress was asked to decide whether the Wyoming Valley section belonged rightly to Connecticut, who claimed it under the original grant. The decision was in favor of Pennsylvania, and Connecticut was allowed to take a section (afterward known as the Western Reserve) of what is now the State of Ohio, and was then the "Northwest Territory," by way of recompense. The third war now came on. The new State of Pennsylvania rejected the plea of the Wyoming Valley colonists that they had bought their holdings in good faith, and sent two companies of the State militia to drive them out. This they did with considerable severity. The people of Pennsylvania resented this action and sent a sheriff's posse to bring back the evicted settlers. A band was hastily gathered, which included many Pennsylvanians, and the militia were attacked and many were killed on both sides. For some years these conflicts continued, with much bloodshed, and finally the trouble was ended in 1807 by the confirming of the settlers in their holdings upon payment to the State of Pennsylvania of trifling sums to cover the cost of recording the papers. Consult Chapman, I. A., 'A Sketch of the History of Wyoming' (Wilkes-Barre 1830); Hayden, H. E., 'Bibliography of the Wyoming Valley, Pa.' (Wilkes-Barre 1885).

PENNANT, pen'ạnt, **Thomas**, English traveler, naturalist and litterateur; b. Downing, Flintshire, Wales, 14 June 1726; d. there, 16 Dec. 1798. He was educated at Oxford, and early made a specialty of the study of minerals and fossils, first attracting attention by an account of an earthquake felt in Flintshire in 1750, which was published in the 'Philosophical Transactions' in 1856. He served as high-sheriff of Flintshire in 1761. He made scientific tours of the British Isles of which he published delightfully readable accounts, and in 1767 was elected a member of the Royal Society. Though not a profound scholar he acquired a considerable reputation as a naturalist, and had a very wide circle of readers owing to his attractive style. His literary output was immense and covered many popular subjects outside of his chosen scientific labors. Among his works are 'British Zoology' (1766); 'Synopsis of Quadrupeds' (1771); afterward enlarged to the 'History of Quadrupeds' (1781); 'Genera of Birds' (1773); 'Indian Zoölogy' (1781); 'Arctic Zoölogy' (1784); 'Of London' (1790); 'The Literary Life of the late Thomas Pennant, Esq. By Himself' (1793); 'History of the Parishes of Whiteford and Holywell' (1796); 'Outlines of the Globe,' two volumes of which were published before his death, and two afterward (1798–1800).

PENNANT, the name given a small flag or banner, generally used on vessels or nautical stations. Pennants are made of various shapes, and the shape and arrangement indicate the rank of the chief officer on board of the ship which wears them, or the number of the ship, the presence or absence of the officer in command, etc. The pennant is usually very long as compared with its width and tapers to a point. In some instances it is only about twice as long as its width, and the free end is cut into a swallowtail. This form is called the "broad pennant," and its edges may be parallel to indicate one rank, or taper to the two tips to indicate another. Again, the pennant may be very short, so as to present an almost equilateral triangle.

PENNANT'S MARTEN. The Canadian "pekan," "fisher," or "black cat," the largest of the martens, 24 to 30 inches long and with a black tail 14 to 18 inches long. The fur is generally a browish shade of black about two inches in length, and is highly esteemed under the commercial title of "American sable." The animal was formerly found plentifully in the United States but is now limited to Canada. See Marten.

PENNATULIDÆ, a family of alcyonarian coral-polyps: the sea-pens (q.v.).

PENNELL, pĕn'ĕl, **Henry Cholmondeley**, English poet and sportsman: b. in London, 1837; d. 1915. He entered the public service in 1853. After serving in various departments of the admiralty, he was made Inspector of Sea Fisheries in 1866, where he served until he was selected in 1875 to carry out commercial reforms for the khedive of Egypt. Upon his return he was appointed director-general of interior commerce. He was an expert marksman winning the Grand Prix of Monaco and the Universal Championship for his shooting. Among his well-known books of verse are 'Puck on Pegasus' (1861); 'The Crescent' (1866); 'Modern Babylon' (1873); 'The Muses of Mayfair' (1874); 'From Grave to Gay' (1885). On angling and ichthyology he has written among other works 'The Angler-Naturalist' (1864); 'The Book of the Pike' (1866); 'Fishing Gossip' (1867); 'The Modern Practical Angler' (1873); two volumes in the 'Badminton Library'—'Salmon and Trout' and 'Pike and Other Coarse Fish' (1885); 'The Sporting Fish of Great Britain' (1886), etc. He was for some years editor of the *Fisherman's Magazine and Review*.

PENNELL, Joseph, American etcher and illustrator: b. Philadelphia, 4 July 1860. He studied in the Pennsylvania School of Industrial Art and the Pennsylvania Academy of Fine Arts. He began illustrating for the *Century Magazine* in 1881, and has been a frequent contributor to it and similar magazines ever since. He executed an important series of etchings to accompany the papers on Italian life, by W. D. Howells, and also a long series on English cathedrals published in conjunction with Mrs. Schuyler Van Rensselaer's book on that subject. He has also illustrated several books of travels written by his wife, Elizabeth Robins Pennell, and is himself the author of an important work on 'Pen Drawing and Pen Draughtsmen' (1889). He is also the author of an extensive series of works, among them 'A Canterbury Pilgrimage' (1885); 'An Italian Pilgrimage' (1886); 'The Jew at Home' (1892); an introduction on the art of the illustrator to Vièrge's 'Pablo de Segovia' (1893); 'Modern Illustration' (1895); 'The Illustration of Books' (1896); 'The Alhambra' (1896); 'The Work of Charles Keane' (1897); 'Lithography and Lithographers' (1900); 'Life of James McNeill Whistler' (with Mrs. Pennell, 1910); 'Pictures of the Panama Canal' (1912); 'The Wonder of Work' (1916). He has been lecturer on illustration at the Slade School of Art, University College, London, and at the Royal College of Art, South Kensington. He has been the recipient of a very large number of awards and prizes and many gold and silver medals. He won the Grand Prize at the Saint Louis Exposition in 1902; the Grand Prix at Milan in 1906; the Grand Prize at London in 1913 and the Grand Prize at Florence in 1915. He has representative works at Luxembourg; in the city of Paris collection; in the Uffizi Gallery, Florence; the Modern Gallery, Venice; the Modern Gallery, Rome; the Berlin National Gallery; the British Museum; the South Kensington Museum; the Guildhall Gallery, London, and also at Dresden, Budapest, Münich, Melbourne, Pearth and Adelaide.

PENNSYLVANIA (the «Keystone State») is the southernmost of the group of the North Atlantic States. The sobriquet, Keystone State, was appropriately given to the commonwealth which occupied the centre of the arch formed by the original 13 States. Its area (land surface only) is 45,126 square miles. In general outline Pennsylvania is a rectangle, having one irregular side formed by the Delaware River and a triangular projection at its northwestern corner extending northward to the shore of Lake Erie. The segment of a circle with a radius of 10 miles drawn from the courthouse at New Castle, Del., cuts a small piece from its southeastern corner. Pennsylvania is 158 miles wide between two parallels of latitude, constituting its northern and southern boundaries, and 302 miles long, measured from the Ohio State line to either of two points on the Delaware, one opposite Port Jervis, N. Y., and the other at Bordentown, N. J., where the river makes its two far eastward bends. Pennsylvania adjoins New York on the north, New York and New Jersey on the east, Delaware, Maryland and West Virginia on the south and West Virginia and Ohio on the west. Its northwest corner lies directly on Lake Erie.

Topography.— The ridge of the Alleghanies divides the State into two nearly equal parts, popularly known as eastern and western Pennsylvania. About one-fourth of the surface is a plateau of an average elevation of nearly 2,000 feet above sea-level, comprising the tier of counties abutting on the northwestern slope of the Alleghanies and the northernmost two tiers of counties from the Delaware to Lake Erie. The plateau descends gradually southward and westward into Ohio. Between the Alleghanies and the Blue or North Mountain range and filling the central part of the State is a complexity of interlocked ridges and valleys curving in parallel lines from the southern boundary northeastwardly. At the foot of the steep wall of the North Mountain, like a moat before a fortress, lies the «Great Valley» of the early settlers, which extends from the Hudson River to central Alabama and is known by many names; in Virginia as the Shenandoah, in New Jersey as the Kittatinny and in Pennsylvania as the Lehigh, Lebanon or Cumberland Valley. It is from 10 to 20 miles wide (in this State), and is limited on the southeast by the South Mountain range. Through the break in this range between Harrisburg and Reading the Great Valley merges into the open country of the southeast. All the ridges of the Appalachian system undergo a considerable lowering before entering the State. The Catskills of New York with summits exceeding 4,000 feet become in Pennsylvania the Pocono Plateau with no elevations greater than 2,000 feet; the Blue Ridge of Kentucky with peaks reaching an altitude of 7,000 feet enters this State as the South Mountain range, which scarcely anywhere attains the height of 2,000 feet, and disappears entirely a little to the west of Harrisburg. It rises again in a ridge of not over 1,000 feet high at Reading, and, passing into New Jersey, becomes the highlands of the Hudson with summits of 3,000 feet. Only a few knobs of the Alleghanies rise to an altitude of 2,700 to 2,800 feet and the North Mountain range, with its narrow, rocky crest, is of the almost perfectly uniform height of 2,000 feet. While destitute of high mountains the surface of the State is everywhere more or less hilly. The southeastern quarter of the State, though but little above sea-level, is a rolling country. and the western section is deeply furrowed by watercourses and broken by short ridges. Western Pennsylvania contains two distinct ranges, Laurel Hill and Chestnut Ridge, running parallel from southwest to northeast about 10 miles apart and enclosing the Ligonier Valley.

Rivers.— The table-land of central and

PENNSYLVANIA.

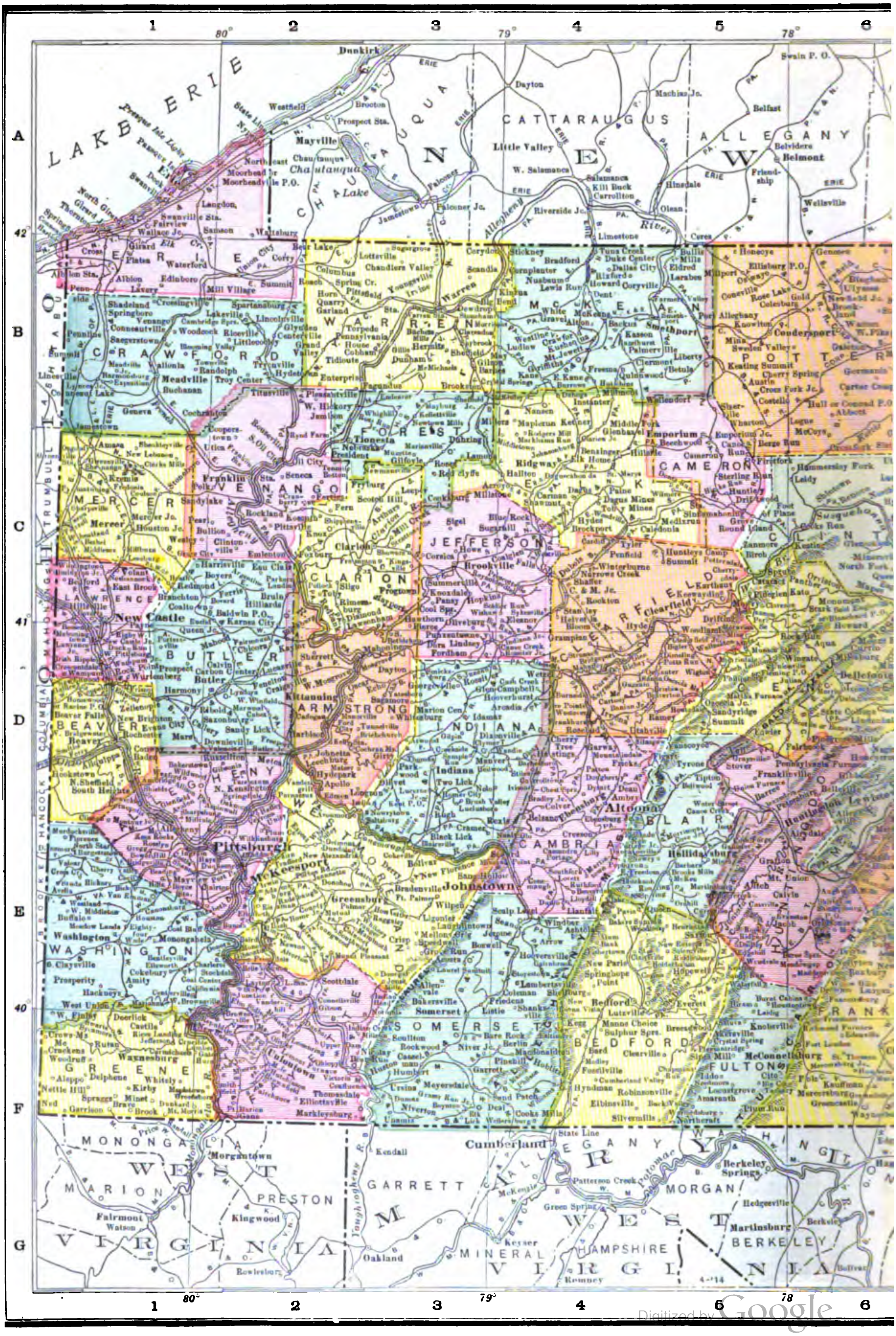
Estimated population, 8,522,017

COUNTIES

Pop.	County	Key
34,319	Adams	F 7
1,018,463	Allegheny	D 1
67,880	Armstrong	D 2
78,353	Beaver	D 1
38,879	Bedford	F 4
183,222	Berks	E 9
108,858	Blair	E 5
54,526	Bradford	B 8
76,530	Bucks	E 11
72,689	Butler	D 2
166,131	Cambria	D 4
7,644	Cameron	C 5
52,846	Carbon	D 10
43,424	Center	D 6
109,213	Chester	F 10
36,638	Clarion	C 3
93,768	Clearfield	C 4
31,545	Clinton	C 6
48,467	Columbia	C 8
61,565	Crawford	B 1
54,479	Cumberland	E 7
136,152	Dauphin	E 8
117,906	Delaware	F 11
35,871	Elk	C 4
115,517	Erie	B 1
167,449	Fayette	F 2
9,435	Forest	B 3
59,775	Franklin	F 6
9,703	Fulton	F 5
28,882	Greene	F 1
38,304	Huntingdon	E 5
66 210	Indiana	D 3
63,090	Jefferson	C 3
15,013	Juniata	E 6
259,570	Lackawanna	C 10
167,029	Lancaster	E 9
70,032	Lawrence	D 1
59,565	Lebanon	E 8
118,832	Lehigh	D 10
343,186	Luzerne	C 9
80,813	Lycoming	C 7
47,868	McKean	B 4
77,699	Mercer	C 1
27,785	Mifflin	D 6
22,941	Monroe	C 11
169,590	Montgomery	E 11
14,868	Montour	C 8
127,667	Northampton	D 11
111,420	Northumberland	D 8
24,136	Perry	E 7
1,549,008	Philadelphia	F 11
8,033	Pike	C 11
29,729	Potter	B 5
207,894	Schuylkill	D 9
16,800	Snyder	D 7
67,717	Somerset	F 3
11,293	Sullivan	C 8
37,746	Susquehanna	B 10
42,829	Tioga	B 7
16,249	Union	D 7
56,359	Venango	C 2
39,573	Warren	B 3
143,680	Washington	E 1
29,236	Wayne	B 11
231,304	Westmoreland	E 2
15,509	Wyoming	B 9
136,405	York	F 8

Incorporated Cities, Boroughs, Etc.

Pop.	Name	Key
300	Adamsburg	E 2
675	Adamstown	E 9
719	Akron	E 9
150	Alba	B 8
1,534	Albion	B 1
661	Aldan, Delaware	F 11
432	Alexandria	D 5
1,743	Aliquippa, Beaver	D 1
63,503	Allentown	D 10
58,659	Altoona	D 5
2,649	Ambler	F 11
5,205	Ambridge	D 1
3,006	Apollo	D 2
7,194	Archbald	C 11
383	Arendtsville	F 7
82	Armagh, Indiana	D 3
1,818	Arnold, Westmoreland	E 3
683	Arona, Westmoreland	E 3
6,855	Ashland	D 9
5,601	Ashley	C 10
384	Ashville	D 4
2,592	Aspinwall	D 2
546	Atglen, Chester	F 10
3,796	Athens	B 8
514	Attleboro, Bucks	E 11
191	Atwood	D 3
921	Auburn	D 9
2,941	Austin	B 5
4,317	Avalon, Allegheny (P. O. Pittsburgh)	D 1
796	Avis	C 7
4,634	Avoca	C 10
668	Avondale	F 10
1,262	Avonmore	D 3
601	Baden	D 1
5,369	Bangor	D 11
3,535	Barnesboro	D 4
1,057	Bath	D 11
407	Beallsville	E 1
221	Bear Lake	B 3
3,456	Beaver	D 1
13,532	Beaver Falls	D 1
1,530	Beaver Meadow	D 10
417	Bechtelsville	E 10
2,235	Bedford	E 4
584	Beech Creek	C 6
4,145	Bellefonte	C 6
2,372	Belle Vernon	E 2
6,323	Bellevue (Sta. Allegheny P.O.)	D 1
2,277	Bellwood	D 5
1,828	Ben Avon, Allegheny	D 1
355	Bendersville	F 7
387	Benson, Somerset	F 3
1,922	Bentleyville	E 1
719	Benton	C 8
1,336	Berlin	F 4
308	Bernville	E 9
377	Berrysburg	D 8
332	Berwick, Adams	F 7
5,357	Berwick	C 9
130	Bethany	B 11
14,142	Bethlehem	D 10
1,032	Big Run	D 3
386	Biglerville	F 7
2,930	Birdsboro	E 10
196	Birmingham	D 5
326	Blain	E 6
3,572	Blairsville	E 3
5,345	Blakely, Lackawanna (P. O. Peckville)	C 10
762	Bloomfield (P. O. New Bloomfield)	E 7
130	Blooming Valley	B 2
7,413	Bloomsburg	C 8
2,303	Blossburg	B 7
518	Bolivar	E 3
1,878	Boswell	F 3
2,433	Boyertown	E 10
3,134	Brackenridge, Allegheny	D 1
21,685	Braddock	E 2
14,544	Bradford	B 4
3,860	Bridgeport	E 11
1,983	Bridgeville	E 1
1,562	Bridgwater	D 1
459	Brisbin	I 5
10,608	Bristol	E 12
478	Broadtop, Huntingdon	E 5
1,898	Brockwayville	C 4
3,003	Brookville	C 3
1,300	Brownstown, Lancaster	E 9
2,324	Brownsville	F 2
539	Bruin	C 2
1,266	Burgettstown	E 1
142	Burlington	B 8
493	Burnside	D 4
27,632	Butler	D 2
2,230	California	E 2
198	Callensburg	C 3
335	Callery	D 2
1,514	Cambridge Springs	B 1
875	Camp Hill, Cumberland	E 7
3,891	Canonsburg	E 1
1,637	Canton	B 8
19,242	Carbondale	B 11
10,726	Carlisle	E 7
478	Carmichaels	F 2
11,692	Carnegie	E 1
6,117	Carrick, Allegheny	D 1
1,348	Carrolltown	D 4
306	Cassandra	E 4
166	Casselman	F 3
165	Cassville	E 5
5,250	Catasauqua	D 10
1,930	Catawissa	D 8
500	Center Hall	D 6
111	Centerport	E 9
264	Centerville	F 2
1,413	Centerville	E 1
2,429	Centralia	D 9
303	Chalfont	E 11
12,380	Chambersburg	F 6
253	Chapman Quarries, Northampton	D 11
11,931	Charleroi	E 2
439	Cherrytree	D 4
113	Cherry Valley	E 1
41,396	Chester	F 11
648	Chester Hill, Somerset	F 3
174	Chest Springs	D 4
317	Cheswick, Allegheny	D 1
934	Christiana	F 9
3,326	Clairton, Allegheny	D 1
933	Clarendon	B 3
2,612	Clarion	C 3
208	Clarkesville	F 1
216	Clarksville (P. O. Clark)	C 1
1:045	Claysville	E 1
6,851	Clearfield	D 5
3,155	Clifton Heights, Delaware	F 11
335	Clintonville	C 2
1 753	Clymer	D 3
816	Coal Center	E 2
311	Coaldale, Bedford	F 4
5,154	Coaldale	D 10
228	Coalmont	E 5
876	Coalport	D 4
14,455	Coatesville	F 10
695	Cochranton	B 2
1,302	Cokeburg Washington	E 1
409	Cokeville	E 3
1,787	College Hill	D 1
621	Collegeville	E 11
1,361	Collingdale, Delaware	F 11
11,454	Columbia	E 8
346	Columbus	B 2
1,584	Colwyn, Delaware	F 11
890	Confluence	F 3
725	Conneaut Lake	B 1
867	Conneautville	B 1
15,455	Connellsville	E 3
400	Conoquenessing, Butler	D 2
7,480	Conshohocken	E 11
1,483	Conway	D 1
406	Conyngham, Luzerne	C 9
683	Coopersburg	E 11
181	Cooperstown	C 2
2,670	Coplay	D 11
5,252	Coraopolis	D 1
5,991	Corry	B 2
301	Corsica	C 3
3,100	Coudersport	B 6
548	Courtdale, Luzerne	C 9
340	Covington	B 7
4,583	Crafton	E 1
563	Creekside	D 3
1,470	Cresson	E 4
1,837	Cressona	D 9
158	Cross Roads, York	F 8
98	Curllsville, Clarion	C 3
2,549	Curwensville	D 4
382	Daisytown, Cambria	D 4
2,285	Dale, Cambria	D 4
576	Dallas	C 9
1,884	Dallastown	F 8
767	Dalton	C 10
7,517	Danville	D 8
6,305	Darby	F 11
311	Darlington	D 1
545	Dauphin	E 8
848	Dawson	E 2
809	Dayton	D 3
477	Deemston, Washington	E 1
1,000	Delano	D 9
446	Delaware Watergap	D 11
881	Delta	F 9
933	Denver	E 9
2,954	Derry	E 3
12,086	Dickson City	C 10
853	Dillsburg	F 7
147	Donegal	E 3
8,174	Donora	E 1
1,115	Dormont, Allegheny	D 1
4,046	Dorranceton	C 10
576	Dover, York	F 8
3,326	Downingtown	E 10
3,304	Doylestown	E 11
1,895	Dravosburg, Allegheny	D 1
517	Driftwood	C 5
14,665	Dubois	C 4
682	Duboistown	C 7
440	Dudley	E 5
1,970	Dunbar	F 2
1,474	Duncannon	E 7
1,263	Duncansville	E 4
150	Dundaff	B 10
20,776	Dunmore	C 10
19,964	Duquesne	E 2
7,487	Duryea, Luzerne	C 9
813	Dushore	C 8
184	Eaglesmere	C 8
1,186	East Bangor	D 11
672	East Berlin	F 8
1,493	East Brady	D 2
5,046	East Conemaugh, Cambria (P.O. Conemaugh)	D 4
1,235	East Greenville	E 11
2,118	East McKeesport, Allegheny	D 1
3,458	East Mauch Chunk	D 10
30,530	Easton	D 11
5,615	East Pittsburg, Allegheny	D 1
316	East Prospect	F 8
718	East Rochester, Beaver	D 1
220	East Side, Carbon	D 10
348	East Springfield, Erie	B 1
3,330	East Stroudsburg	C 11
322	Eastvale, Beaver	D 1
1,852	East Vandergrift Westmoreland	E 2
1,300	East Washington, Washington (P.O. Washington)	E 1
906	East Waynesburg, Greene	F 1
347	Eau Claire	C 2
1,978	Ebensburg	E 4
1,167	Eddystone	F 11
616	Edenburg, Clarion	C 3
2,596	Edgewood, Allegheny (P. O. Pittsburgh)	D 1
1,229	Edgeworth, Allegheny	D 1
666	Edinboro	B 1
10,443	Edwardsville, Luzerne	C 9
944	Elco, Washington	E 1
285	Elderton	D 2
1,235	Eldred	B 5
148	Elgin	B 2
2,311	Elizabeth	E 2
2,587	Elizabethtown	E 9
1,039	Elizabethville	E 8
1,175	Elkland	B 7
2,084	Ellsworth	E 1
3,902	Ellwood City	D 1
379	Elmhurst	C 10
3,501	Emaus	D 11
1,110	Emlenton	C 2
2,916	Emporium	B 5
1,510	Emsworth, Allegheny	D 1
354	Enon Valley	D 1
3,192	Ephrata	E 9
75,195	Erie	A 1
8,830	Etna	D 2
1,339	Evans City	D 1
1,725	Everett	E 5
1,759	Everson	E 3
3,537	Exeter, Luzerne	C 9
759	Factoryville	B 10
1,760	Fairchance	F 2
373	Fairfield	F 7
167	Fairview, Luzerne	C 9
349	Fairview	A 1
172	Fall Brook	B 7
1,204	Falls Creek	C 4
555	Fallston, Beaver	D 1
240	Fawn Grove	F 9
2,005	Fayette City	E 2
241	Felton	F 7
514	Ferndale, Cambria	D 4
644	Finleyville	E 1
1,394	Fleetwood	E 10
1,022	Flemington	C 6
4,850	Ford City	D 3
5,749	Forest City	B 10
109	Forksville	C 8
2,353	Forty Fort, Luzerne	C 9
1,388	Fountain Hill, Lehigh	D 10
3,118	Frackville	D 9
144	Frankfort Spring	E 1
2,102	Franklin, Cambria	D 4
11,307	Franklin	C 2
216	Franklintown	F 8
443	Fredonia	C 1
3,060	Freedom	D 1
6,197	Freeland	C 10
867	Freemansburg	D 11
2,248	Freeport	D 2
103	Friendsville	B 9
4,027	Galeton	B 6
3,504	Gallitzin	E 4
848	Garrett	F 4
917	Gaysport, Blair	E 5
236	Geneva	B 1
269	Georgetown, Beaver	D 1
4,030	Gettysburg	F 7
5,401	Gilberton	D 9
1,165	Girard	B 1
4,396	Girardville	D 9
203	Glasgow, Beaver	D 1
5,540	Glassport, Allegheny	D 1
319	Glenburn	C 10
1,099	Glen Campbell	D 4
823	Glendon	D 11
984	Glenfield	D 1
237	Glen Hope	D 4
1,157	Glen Olden, Delaware	E 11
1,263	Glen Rock	F 8
434	Goldsboro	E 8
1,185	Gordon	D 9
84	Gouldsboro	C 10
666	Grampian	D 4
290	Grand Valley	B 2
536	Gratz, Dauphin	E 8
788	Great Bend	B 10
1,919	Greencastle	F 6
372	Green Lane	E 11
442	Greensboro	F 1
15,483	Greensburg	E 3
1,143	Greentree, Allegheny	D 1
5,909	Greenville	C 1
3,674	Grove City	C 1
745	Halifax	E 8
472	Hallam	F 8
1,538	Hallstead	B 10
2,301	Hamburg	E 9
7,057	Hanover	F 8
673	Harmony	D 1
72,015	Harrisburg	E 8
352	Harrisville	C 2
160	Hartleton	D 7
135	Hartstown, Crawford	B 1
2,125	Hastings	D 4
963	Hatboro	E 11
705	Hatfield, Montgomery	E 11
2,018	Hawley	C 11
569	Hawthorn	C 3
1,888	Hays	E 2
166	Haysville, Allegheny	D 1
1,168	Hazeldell	D 1
28,491	Hazleton	D 9
1,848	Heidelberg, Allegheny	D 1
915	Hellertown	D 11
620	Herndon	D 8
1,669	Highspire, Dauphin	E 8
3,734	Hollidaysburg	E 5
985	Homer City	D 3
22,466	Homestead	E 2
2,945	Honesdale	B 11
581	Honey Brook	E 10
250	Hookstown	D 1
990	Hooversville	E 4
364	Hop Bottom	B 10
590	Hopewell	E 5
136	Hopewell, Chester	F 10
793	Houston	E 1
1,434	Houtzdale	D 5
667	Howard	D 6
2,024	Hughestown, Luzerne	C 9
1,650	Hughesville	C 8
468	Hulmeville, Bucks	E 11
2,128	Hummelstown	E 8
6,861	Huntingdon	E 6
315	Hyde Park	D 2
413	Hydetown	B 2
1,164	Hyndman	F 4
5,749	Indiana	D 3
2,037	Ingram	E 1
800	Irvona	D 4
2,886	Irwin	E 2
247	Ivyland	E 11
269	Jackson Center	C 1
87	Jacksonville, Indiana	D 3
822	Jamestown	C 1
9,468	Jeannette	E 2
377	Jeddo, Luzerne	C 9
357	Jefferson	F 1
347	Jefferson	F 8
2,968	Jenkintown	E 11
109	Jennertown	E 3
3,158	Jermyn	B 10
5,381	Jersey Shore	C 7
662	Johnetta	D 2
4,334	Johnsonburg	C 4
68,529	Johnstown	E 3
603	Jonestown	E 8
5,285	Juniata, Blair	E 5
6,626	Kane	B 4
283	Karns City	C 2
2,049	Kennett Square	F 10
6,449	Kingston	C 10
4,311	Kittanning	D 3
5,651	Knoxville, Allegheny (P. O. Pittsburgh)	D 1
840	Knoxville	B 7
2,360	Kutztown	D 10
479	Laceyville	B 9
528	Laflin, Luzerne	C 9
50,853	Lancaster	F 9
268	Landingville, Schuylkill	D 9
252	Landisburg	E 7
771	Lanesboro	B 5
896	Langhorne	E 12
170	Langhorne Manor Berks	E 9
3,551	Lansdale	E 11
4,066	Lansdowne, Delaware	F 11
10,477	Lansford	D 10
258	Laplume	B 10
245	Laporte	C 8
9,288	Larksville, Luzerne	C 9
11,393	Latrobe	E 3
790	Laurel Run, Luzerne	C 9
549	Lawrenceville	B 7
20,779	Lebanon	E 9
3,624	Leechburg	D 2
1,904	Leetsdale, Allegheny	D 1
5,316	Lehighton	D 10
1,393	Lemoyne	E 7
153	Lenhartsville	D 10
326	Le Raysville	B 9
233	Lewisberry	E 8
3,081	Lewisburg	F 8
10,733	Lewistown	D 6
579	Lewisville, Potter	B 5
253	Liberty	B 7
1,575	Ligonier	F 3
1,638	Lilly	E 4
833	Linesville	B 1
2,082	Lititz	E 9
156	Little Meadows	B 9
1,347	Littlestown	F 7
124	Livermore	E 3
596	Liverpool	D 7
7,772	Lock Haven	C 6
375	Loganton	D 7
296	Loganville, York	F 8
273	Long Branch, Washington	E 1
246	Loretto, Cambria	D 4
363	Lumber City, Clearfield	C 4
5,426	Luzerne	C 10
2,943	Lykens	D 8
3,389	McAdoo	D 9
579	McConnellsburg	F 5
2,543	McDonald	E 1
209	McEwensville, Northumberland	D 8
47,521	McKeesport	E 2
19,949	McKees Rocks	E 1
813	McMahan, Westmoreland	E 2
1,724	McSherrystown	F 8
514	McVeytown	E 6
772	Macungie, Lehigh	D 10
421	Madison, Westmoreland	E 2
754	Mahaffey	D 4
17,463	Mahanoy City	D 9
1,125	Malvern	F 10
547	Manchester	E 8
2,202	Manheim	E 9
341	Manns Choice	F 4
1,039	Manor	E 2
545	Manorville	D 3
1,645	Mansfield	B 7
752	Mapleton Depot	E 5
1,573	Marcus Hook	F 11
1,363	Marianna	E 1
2,079	Marietta	E 8
366	Marion Center	D 3
1,362	Marion Heights, Northumberland	D 8
211	Marklesburg	E 5
227	Markleysburg	F 3
1,215	Mars	D 1
920	Martinsburg	E 5
1,693	Marysville	E 7
890	Masontown, Fayette	F 2
1,388	Matamoras	C 12
3,952	Mauch Chunk	D 10
3,662	Mayfield	B 10
13,802	Meadville	B 1
4,469	Mechanicsburg	E 7
159	Mechanicsburg, Indiana	D 3
3,562	Media	F 11
2,026	Mercer	C 1
1,410	Mercersburg	F 5
630	Meshoppen	B 9
3,741	Meyersdale	F 4
207	Middleboro, Erie	B 1
531	Middleburg	D 7
1,100	Middleport	D 9
5,374	Middletown	E 8
1,244	Midland, Beaver	D 1
941	Midway	E 1
1,559	Mifflinburg	D 7
954	Mifflintown	D 7
531	Milesburg	D 6
872	Milford	C 12
308	Mill Creek	E 6
322	Millbourne, Philadelphia	F 11
2,394	Millersburg	E 8
993	Millerstown, Butler	D 2
549	Millerstown	E 7
1,043	Mill Hall	C 6
626	Millheim	D 6
7,861	Millvale, Allegheny	D 1
290	Mill Village	B 1
611	Millville	C 8
7,460	Milton	D 8
3,159	Miners Mills	C 10
7,240	Minersville	D 9
1,536	Mohnton, Berks	E 9
3,376	Monaca, Beaver	D 1
21,630	Monessen	E 2
7,598	Monongahela	E 1
403	Monroeton	B 8
1,490	Montgomery	C 8
1,904	Montoursville	C 8
1,914	Montrose	B 9
3,964	Moosic	C 10
2,002	Morrisville	E 12
1,071	Morton	F 11
650	Moscow	C 10
335	Mt. Carbon	D 9
20,208	Mt. Carmel	D 8
1,272	Mt. Holly Springs	E 7
1,771	Mt. Jewett	B 4
2,166	Mt. Joy	E 8
382	Mt. Morris	F 1
4,241	Mt. Oliver, Allegheny	D 1
785	Mt. Penn, Berks	E 9
5,812	Mt. Pleasant	E 3
3,338	Mt. Union	E 6
1,904	Muncy	C 8
803	Mountville	E 9
5,185	Munhall, Allegheny	D 1
23,126	Nanticoke	C 9
1,790	Narberth, Montgomery	E 11
3,978	Nazareth	D 11
448	Nelson	B 7
1,578	Nescopeck	C 9
413	New Albany	B 8
505	New Alexandria	E 2
177	New Baltimore	F 4
527	New Berlin	D 7
1,625	New Bethlehem	C 3
9,277	New Brighton	D 1
135	New Buffalo	E 7
274	Newburg, Clearfield	C 4
264	Newburg, Cumberland	E 7
41,133	New Castle	C 1
106	New Centerville, Chester	F 10
175	New Columbus	C 9
1,472	New Cumberland, Cumberland	E 7
717	New Florence	E 3
726	New Freedom	F 8
453	New Galilee	D 1
1,106	New Holland	E 9
1,083	New Hope	E 11
7,707	New Kensington	D 2
164	New Lebanon	C 1
654	New Milford	B 10
838	New Oxford	F 7
194	New Paris	E 4
2,512	New Philadelphia, Schuylkill	D 9
2,009	Newport	E 7
266	New Ringgold	D 10
380	Newry	E 4
424	New Salem, Westmoreland	E 2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LAKE ERIE
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CHAUTAUQUA
CATTARAUGUS
ALLEGANY
Dunkirk
Westfield
Mayville
Chautauqua Lake
Jamestown
Little Valley
Salamanca
Olean
Belmont
Wellsville
Allegheny River
ERIE
Erie
North East
Waterford
Corry
Union City
Albion
Edinboro
CRAWFORD
Meadville
Titusville
Conneaut Lake
WARREN
Warren
McKEAN
Smethport
Bradford
Kane
POTTER
Coudersport
FOREST
Tionesta
ELK
Ridgway
CAMERON
Emporium
VENANGO
Franklin
Oil City
MERCER
Mercer
Greenville
Sharon
CLARION
Clarion
JEFFERSON
Brookville
Punxsutawney
CLEARFIELD
Clearfield
DuBois
Philipsburg
CENTRE
Bellefonte
LAWRENCE
New Castle
BUTLER
Butler
ARMSTRONG
Kittanning
INDIANA
Indiana
BEAVER
Beaver
Beaver Falls
ALLEGHENY
Pittsburgh
McKeesport
WESTMORELAND
Greensburg
CAMBRIA
Johnstown
Ebensburg
BLAIR
Altoona
Hollidaysburg
Tyrone
HUNTINGDON
Huntingdon
WASHINGTON
Washington
Monongahela
GREENE
Waynesburg
FAYETTE
Uniontown
Connellsville
SOMERSET
Somerset
BEDFORD
Bedford
FULTON
McConnellsburg
FRANKLIN
OHIO
TRUMBULL
MAHONING
COLUMBIANA
HANCOCK
BROOKE
MONONGALIA
MARION
PRESTON
WEST VIRGINIA
Morgantown
Fairmont
Kingwood
GARRETT
Oakland
ALLEGANY
Cumberland
MARYLAND
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Berkeley Springs
BERKELEY
Martinsburg
WASHINGTON
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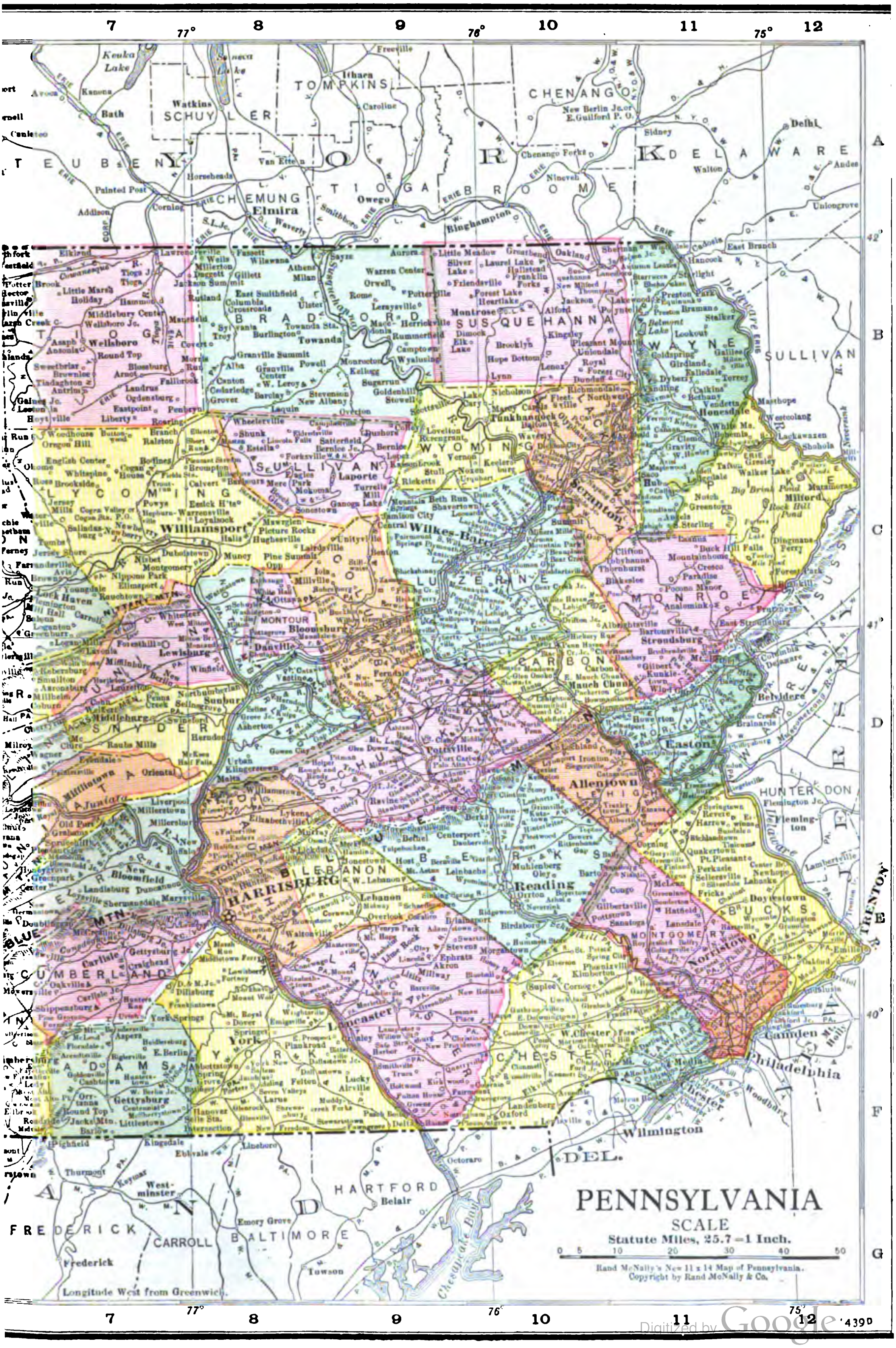

PENNSYLVANIA

SCALE

Statute Miles, 25.7 = 1 Inch.

Rand McNally's New 11 x 14 Map of Pennsylvania.
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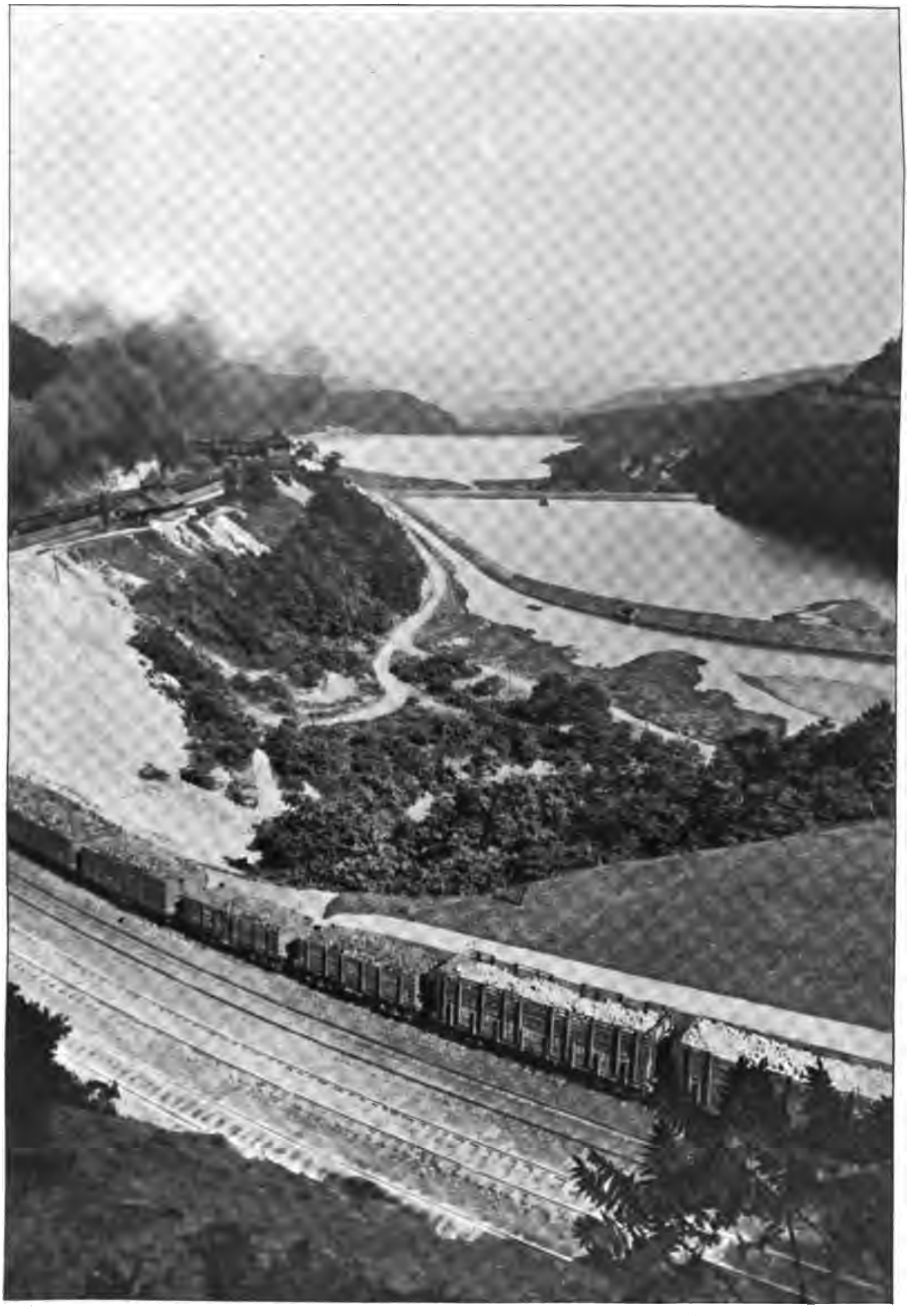
Pop.		
248	New Salem	F 8
340	Newton Hamilton	E 6
1,675	Newtown	E 11
1,449	Newville	E 7
174	New Washington, Clearfield	C 4
758	New Wilmington	C 1
852	Nicholson	B 10
31,401	Norristown	E 11
8,729	Northampton	D 11
1,037	Northampton Heights, Northampton	D 11
1,522	North Bellevernon, Westmoreland	E 2
15,148	North Braddock, Allegheny	D 1
2,030	North Catasauqua	D 10
1,008	North Charleroi	E 2
2,672	North East	A 2
646	North Irwin, Westmoreland	E 2
3,517	Northumberland	D 8
1,710	North wales	E 11
1,902	North York, York	F 8
1,668	Norwood Station, Delaware	F 11
124	Nuangola, Luzerne	C 9
1,353	Oakdale	E 1
915	Oakland	B 10
3,436	Oakmont	D 2
535	Ohioplye	F 3
10,297	Oil City	C 2
14,902	Old Forge	C 10
9,964	Olyphant	C 10
399	Orangeville	C 8
618	Orbisonia	E 6
247	Orrstown	E 6
1,801	Orwigsburg	D 9
425	Osburn, Allegheny	D 1
2,437	Osceola Mills	D 5
591	Osceola	B 7
381	Oswago	B 5
2,390	Oxford	F 9
999	Paint, Somerset	F 3
1,873	Palo Alto	D 9
1,244	Parkers Landing	C 2
2,522	Parkesburg	F 10
2,578	Parnassus	D 2
590	Parryville	D 10
4,338	Parsons, Luzerne	C 9
885	Patterson	D 7
367	Patterson Heights, Beaver	D 1
3,907	Patton	D 4
3,967	Pen Argyl	D 11
1,462	Penbrook	E 8
1,048	Penns Station	E 2
1,141	Pennsburg	E 10
2,779	Perkasie	E 11
705	Petersburg	D 6
360	Petrolia, Butler	D 2
1,709,518	Philadelphia	F 12
3,585	Philipsburg	D 5
11,714	Phoenixville	E 10
576	Picture Rocks	C 8
1,352	Pine Grove	D 9
4,975	Pitcairn	E 2
579,090	Pittsburgh	E 2
18,599	Pittston	C 10
220	Platea	B 1
191	Pleasantville, Bedford	F 4
702	Pleasantville	B 2
414	Plumville	D 3
19,100	Plymouth	C 10
1,389	Point Marion	F 2
2,066	Polk	C 2
2,954	Portage	E 4
1,972	Port Allegany	B 5
2,678	Port Carbon	D 9
491	Port Clinton	D 9
170	Portersville	D 1
649	Portland	D 11
535	Port Royal	E 6
1,978	Portvue, Allegheny	D 1
16,794	Pottstown	E 10
22,372	Pottsville	D 9
263	Prompton	B 11
346	Prospect	D 1
1,655	Prospect Park, Delaware	F 11
10,043	Punxsutawney	D 4
3,801	Quakertown	E 11
739	Quarryville	F 9
72	Queenstown, Armstrong	D 2
308	Railroad, York	F 8
203	Rainsburg	F 8
1,045	Ramey	D 5
6,042	Rankin, Allegheny (P. O. Braddock)	D 1
109,381	Reading	E 10
664	Red Hill	E 11
2,092	Red Lion	F 8
4,621	Renovo	C 6
3,189	Reynoldsville	C 3
671	Rices Landing	F 1
121	Riceville	B 2
722	Richland	E 9
562	Richlandtown	E 11
5,408	Ridgway	C 4
1,761	Ridley Park	F 11
855	Rimersburg	C 2
723	Ringtown	D 9
429	Riverside	D 8
1,903	Roaring Spring	E 5
5,903	Rochester	D 1
504	Rockhill Furnace	E 6
879	Rockledge, Montgomery	E 11
1,300	Rockwood	F 3
222	Rome	B 9
1,450	Roscoe, Washington	E 1
419	Rosedale, Cambria	D 4
648	Rouseville	C 2
1,033	Royalton, Dauphin	E 8
3,078	Royersford	E 10
763	Rural Valley, Armstrong	D 2
523	Rutledge, Delaware	F 11
712	Saegerstown	B 1
885	Salisbury, Somerset	F 3
280	Salladasburg	C 7
410	Saltillo	E 5
1,044	Saltsburg	E 3
639	Sandy Lake	C 1
687	Sankertown, Cambria	D 4
345	Saxonburg	D 2
1,195	Saxton	E 5
6,426	Sayre	B 8
1,424	Scalp Level	E 4
314	Schellsburg	E 4
4,747	Schuylkill Haven	D 9
381	Schwenksville, Montgomery	E 11
5,456	Scottdale	E 2
146,811	Scranton	C 10
1,473	Selinsgrove	D 7
1,572	Sellersville	E 11
368	Seven Valleys	F 8
548	Seward	E 4
4,479	Sewickley	E 2
143	Shade Gap	E 6
21,129	Shamokin	D 8
13,618	Sharon	C 1
1,401	Sharon Hill	F 11
8,976	Sharpsburg	D 2
3,634	Sharpsville	C 1
126	Sheakleyville	C 1
117	Shelocta	D 3
29,201	Shenandoah	D 9
1,917	Shickshinny	C 9
1,427	Shillington, Berks	E 9
1,598	Shinglehouse	B 5
3,457	Shippensburg	F 7
378	Shippenville	C 2
545	Shiremanstown	E 7
256	Shirleysburg	E 6
598	Shrewsbury	F 8
232	Silverdale	E 11
1,616	Siverly, Venango	C 2
4,434	Slatington	D 10
754	Sligo	C 2
370	Slippery Rock	C 1
1,817	Smethport	B 5
230	Smicksburg	D 3
749	Smithfield	F 2
784	Smithton	E 2
643	Snow Shoe	C 6
288	Snydertown, Northumberland	D 8
180	Somerfield, Somerset	F 3
2,612	Somerset	F 4
1,875	Souderton	E 11
1,814	South Allentown, Lehigh	D 10
439	South Bethlehem	D 3
24,204	South Bethlehem	D 11
3,943	South Brownsville, Fayette	F 2
1,697	South Canonsburg, Washington	E 1
4,592	South Fork	E 4
1,748	South Greensburg, Westmoreland	E 2
365	South Heights	D 1
551	South New Castle, Lawrence	D 1
434	South Philipsburg, Center	D 6
805	South Renovo, Clinton (P. O. Renovo)	C 6
10,190	South Sharon, Mercer	C 1
1,084	South Waverly, Bradford (P.O. Waverly, N.Y.)	B 8
2,127	Southwest Greensburg, Westmoreland	E 2
3,734	South Williamsport, Lycoming	C 7
2,700	Spangler, Cambia	D 4
460	Spartansburg	B 2
383	Speers, Washington	E 1
614	Springboro	B 1
2,880	Spring City	E 10
1,999	Springdale	D 2
1,100	Spring Garden, Allegheny (P. O. Pittsburgh)	D 1
1,152	Spring Grove	F 8
5,640	St. Clair, Allegheny	D 1
6,455	St. Clair	D 9
101	St. Clairsville	E 5
6,346	St. Marys	C 4
453	St. Petersburg	C 2
381	Starrucca	B 11
1,425	State College	D 6
15,548	Steelton	E 8
674	Stewartstown	F 8
179	Stillwater	C 9
761	Stockdale	E 1
426	Stockertown, Northampton	D 11
1,074	Stoneboro	C 1
355	Stoystown	E 4
885	Strasburg	F 9
376	Strattanville	C 3
4,379	Stroudsburg	D 11
459	Sugar Grove	B 3
2,439	Sugar Notch, Luzerne	C 9
863	Summerhill	E 4
609	Summerville	C 3
4,209	Summithill	D 11
16,260	Sunbury	D 8
3,478	Susquehanna	B 10
917	Suterville, Westmoreland	E 2
1,899	Swarthmore, Delaware	F 11
7,381	Swissvale, Allegheny	D 1
5,396	Swoyersville, Luzerne (P. O. Maltby)	C 9
1,756	Sykesville	C 4
217	Sylvania	B 8
12,077	Tamaqua	D 10
7,414	Tarentum	D 2
512	Tatamy	D 11
11,105	Taylor	C 10
871	Telford	E 11
882	Terre Hill	E 9
293	Thompsontown, Juniata	E 6
322	Thomson	B 10
230	Thornburg, Allegheny	D 1
248	Three Springs	E 6
5,133	Throop	C 10
1,324	Tidioute	B 3
533	Tioga	B 7
803	Tionesta	C 3
8,713	Titusville	B 2
809	Topton	E 10
4,281	Towanda	B 8
2,325	Tower City	D 8
317	Townville	B 1
1,959	Trafford	E 2
398	Trappe, Montgomery	E 11
2,067	Tremont	D 9
260	Troutville, Clearfield	C 4
1,288	Troy	B 8
611	Trumbauersville, Bucks	E 11
622	Tullytown, Bucks	E 11
1,598	Tunkhannock	B 9
661	Tunnelhill, Cambria	D 4
365	Turbotville	C 8
4,995	Turtle Creek	E 2
468	Twilight, Washington	E 1
7,176	Tyrone	D 5
3,684	Union City	B 2
355	Union Dale	B 10
20,780	Uniontown	F 2
291	Uniontown, Dauphin (P. O. Pillow)	E 8
343	Unionville (P. O. Fleming)	D 5
2,221	Upland, Delaware	F 11
338	Ursina	F 3
265	Utica	C 2
240	Valencia	D 2
1,198	Vanderbilt	E 2
3,876	Vandergrift	D 3
3,438	Vandergrift Heights, Westmoreland	E 2
985	Vandling	B 11
251	Venango	B 1
2,849	Verona	E 2
1,437	Versailles, Allegheny	D 1
1,410	Vintondale	E 4
185	Volant	C 1
1,962	Wall, Allegheny	D 1
324	Wallaceton	D 5
1,039	Walnutport	D 10
980	Wampum	D 1
14,737	Warren	B 3
1,251	Warrior Run, Luzerne	C 9
21,618	Washington	E 1
560	Washington Boro, Lancaster	E 9
183	Washingtonville	C 8
724	Waterford	B 1
1,950	Watsontown	C 8
283	Wattsburg	A 2
515	Waverly	C 10
412	Waymart	B 11
7,199	Waynesboro	F 6
3,545	Waynesburg	F 1
2,501	Weatherby	D 10
638	Weissport	D 10
193	Wellersburg	F 4
3,183	Wellsboro	B 7
308	Wellsville, York	F 8
426	West Alexander	E 1
5,512	West Berwick, Columbia	C 8
2,036	West Brownsville	E 2
13,176	West Chester	F 10
2,202	West Conshohocken, Montgomery	E 11
1,033	West Easton, Northampton	D 11
841	West Elizabeth	E 2
495	West End, Venango	C 2
1,207	Westfield	B 6
1,261	Westgrove	F 10
4,715	West Hazelton, Luzerne (P. O. Hazelton)	C 9
3,009	West Homestead, Allegheny	D 1
589	West Kittanning, Armstrong	D 2
436	West Leesport	E 9
199	West Liberty, Butler	D 2
1,157	West Middlesex	C 1
274	West Middletown	E 1
1,468	Westmont, Cambria	D 4
2,880	West Newton	E 2
569	Westover	D 4
6,848	West Pittston, Luzerne (P. O. Pittston)	C 9
2,064	West Reading, Berks	E 9
933	West Reynoldsville, Jefferson	C 3
283	West Sunbury, Butler	D 2
664	West Telford, Montgomery	E 11
1,626	Westview	D 2
1,621	West Wyoming, Luzerne	C 9
2,435	West York, York	F 8
955	Wheatland	C 1
1,547	Whitaker, Allegheny	D 1
1,438	White Haven	C 10
2,775	Wickboro, Armstrong	D 2
76,776	Wilkes-Barre	C 10
23,228	Wilkinsburg (Ind. Sta. Pittsburg P. O.)	E 2
1,523	Williamsburg	E 5
33,809	Williamsport	C 7
2,904	Williamstown	D 8
6,133	Wilmerding	E 2
314	Wilmore	E 4
1,108	Wilson, Allegheny	D 1
8,013	Windber	E 4
832	Windgap	D 11
697	Windsor	F 8
238	Winterstown, Bucks	E 11
5,280	Winton	C 1
1,301	Womelsdorf	E
255	Woodbury	E
130	Woodcock	B
1,396	Woodlawn	D
809	Wormleysburg, Cumberland	E
436	Worthington, Armstrong	D
121	Worthville, Jefferson	C
2,051	Wrightsville	F
580	Wyalusing	B
3,010	Wyoming	C 1
985	Wyomissing	E
894	Yardley	E 1
573	Yatesville, Luzerne	C
882	Yeadon	F 1
567	Yoe, York	F
51,666	York	F
793	Yorkhaven	E
299	York Springs	F
323	Youngstown, Westmoreland	E
1,406	Youngsville	B
1,881	Youngwood	E
1,388	Zelienople	D

northern Pennsylvania forms the water parting. A small quantity of the rainfall is drained southward through the Potomac, and a still smaller part is carried away northward by the Genesee River into Lake Ontario. The three great drainage systems are those of the Ohio, the Susquehanna and the Delaware. Beginning with the Water Gap in the Pocono Plateau the otherwise unbroken wall of the North Mountain is pierced by five gateways through which flow, in the order named, the Delaware, the Lehigh, the Schuylkill, the Swatara and the Susquehanna. The Delaware drains only three northeastern counties of the State, the Lehigh enters the former river at Easton, after draining parts of Carbon and Monroe counties and passing in its course the conical mountain at Mauch Chunk, one of the most familiar landmarks of the country. The Schuylkill drains the remainder of the lower anthracite regions and joins the Delaware at Philadelphia. The Brandywine, the lowest of the Delaware's tributaries, may be here mentioned for its historic interest. It flows through the Chester Valley in Pennsylvania and debouches at Wilmington, Del. The Swatara is an inconsiderable stream, but its water gap is like the others mentioned. The Susquehanna divides at Sunbury into two main branches, which spread their watery tentacles over the whole country from the Mohawk Valley in New York to Cambria County in western Pennsylvania. Ascending the North Branch 50 miles, one enters the Valley of Wyoming through another grand mountain gate. Central Pennsylvania is drained mainly by the Juniata, the largest tributary of the Susquehanna and the most picturesque river in the State, winding through this topographical labyrinth, now laughing in the sunlight of a broad valley and then rushing darkly between frowning and over-hanging cliffs. The drainage system of western Pennsylvania is constituted of the Allegheny and the Monongahela and their affluents. The former flows alternately southwest and southeast, and at Pittsburgh is joined by the latter, which rises in Virginia and has a northward course of 80 miles within the State, the united streams forming the Ohio. The Conemaugh, which collects the waters of the highlands west of the Allegheny at Johnstown, and the Youghiogheny, which, like the Monongahela, rises in Virginia, cut through the Laurel Hill range, and, after crossing the Ligonier Valley, break in similar fashion through Chestnut Ridge; the four gorges each rising almost vertically 1,200 to 1,300 feet from the river beds to the mountain tops. The Conemaugh and Loyalhanna unite at Saltsburg, forming the Kiskimenetas, which joins the Allegheny at Freeport; the Youghiogheny joins the Monongahela at McKeesport.

Climate.— The climate of southeastern Pennsylvania is comparatively mild; zero weather is of rare occurrence. The Alleghanies act as a wind break and protect the eastern valley from the northwestern cold waves. The lower Delaware is often filled with ice, mostly drift ice from above and, though navigation is sometimes impeded, it is never closed. Above Philadelphia the river is frozen solid about once in four or five years. The cold spell is usually broken by one or two midwinter thaws. The summer temperature of southeastern Pennsylvania is often above 90° F. in the middle of the day and the humidity makes the heat very oppressive. The winters in the central and northern mountain regions are quite rigorous, but the summer temperature is more moderate than that of the southeastern part of the State, owing to the elevation and comparative dryness of the atmosphere. The western part of the State has the climate common to the Lower Lake regions. From observations taken at the agricultural experiment station in Centre County for 16 years (1866–1902) the annual rainfall ranged from 30.28 to 43.88 inches. The average monthly temperatures for January ran from 18° to 36.60° F., and the average for July from 65.40° to 76.16°.

Geology.— The geological division of the State coincides with the popular geographical division thereof into eastern and western Pennsylvania; the ridge of the Alleghanies being the divisional line. Western Pennsylvania belongs to the geological province of the Mississippi Valley, and is one vast field of bituminous coal, overlaid and underlaid by Carboniferous sandstone and conglomerate. The uppermost and most valuable of the bituminous coal measures is the Pittsburgh; and from the outlying remnants of the same found on the Broad Top Mountain and in Maryland, and also from the identification of the Pittsburgh with one or two of the deposits of anthracite in northwestern Pennsylvania, it has been conjectured that this coal had its origin in a growth of swamp vegetation almost coextensive with the State. The original northern limit of the Pittsburgh bed in the direction of Lake Erie is now undeterminable, for the whole Allegheny Valley and the upper Susquehanna Valley has been denuded of the same by those slow but potent levelers, frost and rain, though the middle and lower coal measures in these regions have been preserved. Going northward, the middle and lower beds consecutively disappear, until only patches of the lowest workable deposits maintain a precarious existence on the highest land; and in the extreme north the old red sandstone of the Catskill (Devonian) formation, which underlies the Carboniferous sandstone, is exposed in broad bands along all the watercourses. Eastern Pennsylvania belongs to the geological province of the Atlantic seaboard and is partly a region of mountains of Devonian and Silurian age and partly an open country of the still older Cambrian and Archæan periods. A broad continuous belt of Jurassic-Triassic brownstone and trap crosses the latter from west to east, and Cretaceous rocks underlie a narrow strip along the Delaware, below Trenton. A sheet of glacial drift covers the northern part of the State down to a line drawn from Belvidere, N. J., to Olean, N. Y., and curving from the latter place through Warren, Venango and Beaver counties to a point on the western State line, a few miles north of the point of exit of the Ohio River. On the Pocono plateau, in the northeastern section of the State, the old red Catskill sandstone occupies nearly the entire surface. Within a deep trough in the otherwise horizontal outspread of the Catskill formation lie the anthracite deposits of Luzerne County, the best preserved in the State; for so deep is this trough that not only the lower and middle measures and the measure identified with the Pittsburgh have been saved, but there are still higher coal beds, and above these remnants of still higher rocks, containing Permian fossils found elsewhere in the State only in its extreme southwestern corner. The coal beds of the lower anthracite region lie in a series of parallel folds and rise steeply to the soil at their edges; the inclination of one bed being opposite to that of the bed in the next pocket. An arch described in the direction of an ascending seam and down again in the direction of descent of the next following would rise thousands of feet in air; and this aerial arch would represent the amount of erosion which the strata underlying the coal and the coal measures themselves have undergone. It is estimated that only one ton in a hundred of the original deposits of anthracite has been preserved. Another illustration of the stupendous changes wrought in the topography of Pennsylvania by the frosts and rains of ages is found in the region of the Alleghanies. Wherever the Carboniferous formations (which once covered the entire surface of the State) have been preserved in geological basins, there are the mountain ridges of to-day; where these formations were arched they have been eroded away and their places taken by the valleys of the present time. The Catskill sandstone crops out beneath the Carboniferous escarpment of the Alleghanies on the western side of the Nittany Valley, for instance, in a bold bluff. The same formation is recognizable with an opposite dip on the Broad Top, 20 miles to the east. The lower Devonian and Silurian rocks crop out in their regular order on the flanks of both mountains, and in the valley between; and an arch connecting the old red sandstone bluff with the same formation on the Broad Top would reach an altitude of 21,760 feet at its keystone line, if the measured thickness of the sandstone itself and of the underlying strata be added together. If to these one should add the thickness of the overlaying Carboniferous strata, up to and including the Pittsburgh coal bed (which has been preserved on the Broad Top), the total height of these primordial mountains, which have been dissolved in the weathering process of millions of years, would appear to have been over five miles.

Mineral Resources.— Pennsylvania far surpasses any other State in the value of its mineral products. It produces nearly half of all the coal mined in the United States and contains the largest deposits of anthracite to be found anywhere in the world. The production of this variety of coal was about 25,000,000 long tons in 1880; about 50,000,000 long tons in 1900 and now averages about 80,000,000 long tons a year. When mineral fuel was first substituted for charcoal in the blast furnaces only anthracite was used, and for many years the quantity of bituminous coal so employed was relatively small. Since 1875 this relation has been gradually reversed. In 1880 bituminous coal and coke pig iron constituted 35 per cent of the total production; in 1890 it was 61 per cent, in 1900 over 76 per cent and now it constitutes practically the whole output. In the making of steam for motive power in the manufacturing and transporting industries and in the production of illuminating gas, bituminous coal has supplanted anthracite; and the use of the latter is being more and more limited to household purposes. The most important of the bituminous coal measures of the State is the Pittsburgh in Fayette, Westmoreland, Allegheny and Indiana counties. The bed varies in thickness between 6 and 12 feet, and in the quantity of fixed carbon from 59 to 64 per cent. The production of bituminous coal in Pennsylvania increased from 18,425,163 tons (2,000 pounds) in 1880 to 42,302,173 tons in 1890, and 79,842,326 tons in 1900. Since then the production of bituminous coal in Pennsylvania has increased by leaps and bounds. The output rose to 173,781,217 tons in 1913 and, though production has fluctuated under influence of the abnormal conditions prevailing during the last three years, an estimated annual output of 158,000,000 tons, which was the product of Pennsylvania's soft coal mines in 1915, probably, would not be far from correct. This would mean a nearly ninefold increase in the annual production of bituminous coal in the State during the past 35 years. In the production of coke Pennsylvania continues far in the lead. A considerable proportion of the coke produced in the United States is made in ovens or retorts operated by large corporations that not only mine the coal and make the coke but also operate blast furnaces and steel mills which consume their entire coke product. Much coke, moreover, is a by-product of the gas and other industries. Under these circumstances accurate statistical information, either as to output or values, is difficult to obtain and tabulate. From a collection of the most reliable data it appears, however, that out of a total of from 50,000,000 to 62,000,000 tons of coal consumed per year in the United States in the manufacture of coke 60 per cent is coked in Pennsylvania. Connellsville is the centre of coke production. New installations are rapidly superseding the bee-hive coking ovens and by-products exceeding in value the coke produced will ultimately be saved. Oil was first struck in the vicinity where Titusville now stands on 29 Aug. 1859. Within the next few years hundreds of wells were drilled in the Oil Creek region. The wildly speculative character of the business in its booming days is reflected in the range of petroleum prices from $19.25 a barrel in January 1860 to 10 cents a barrel in January 1862. The first oil fields have long since become exhausted and, though others have been successively discovered and worked, the State is now outranked as a producer by several States in the Middle Western, Southwestern and Pacific Coast oil fields. In 1915 Pennsylvania's marketed output of crude petroleum amounted to 7,838,705 barrels, which was about 2¾ per cent of the total for the United States. In the total value of its product, however, Pennsylvania still ranks fifth among the States. Its 1915 output brought $12,431,353 (about $1.57½ per barrel) whereas the 10 times greater California product for that year brought not quite three times as much. In 1909 Pennsylvania produced natural gas to the value of $20,475,207, which was nearly one-third the value of the total output of the United States. At the present time Pennsylvania ranks second among the States in the production and consumption of natural gas, its output in 1915 being valued at $21,139,605, more than one-fifth the total for the country. This proportion is being maintained. Southwestern Pennsylvania and the adjoining parts of



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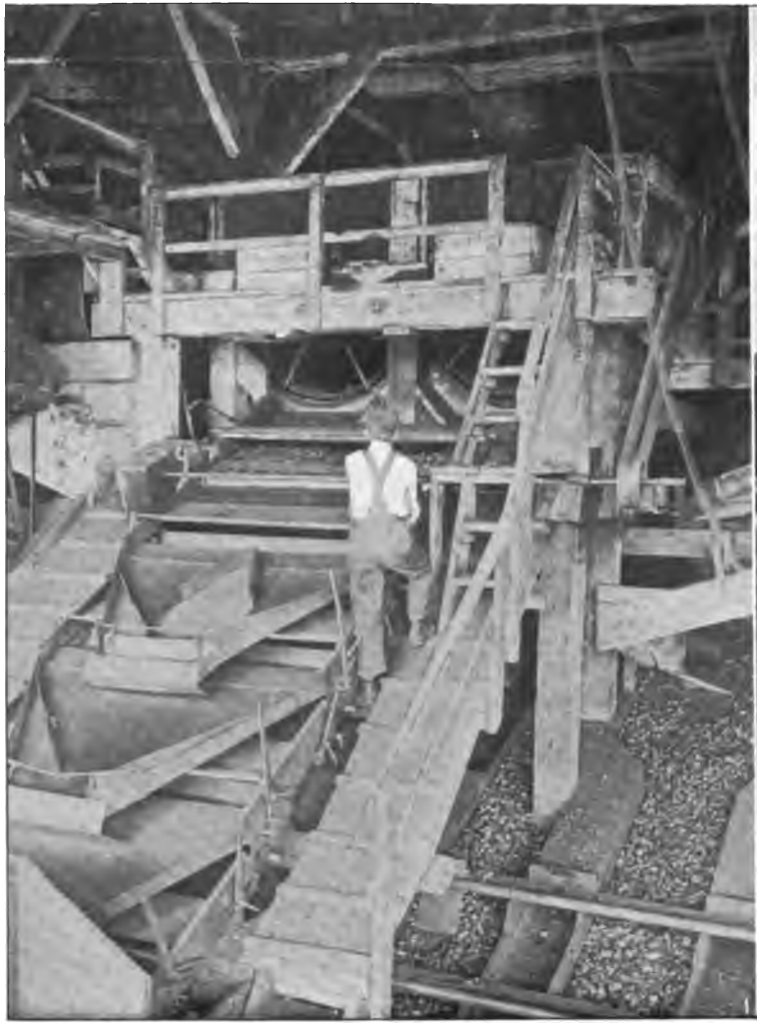
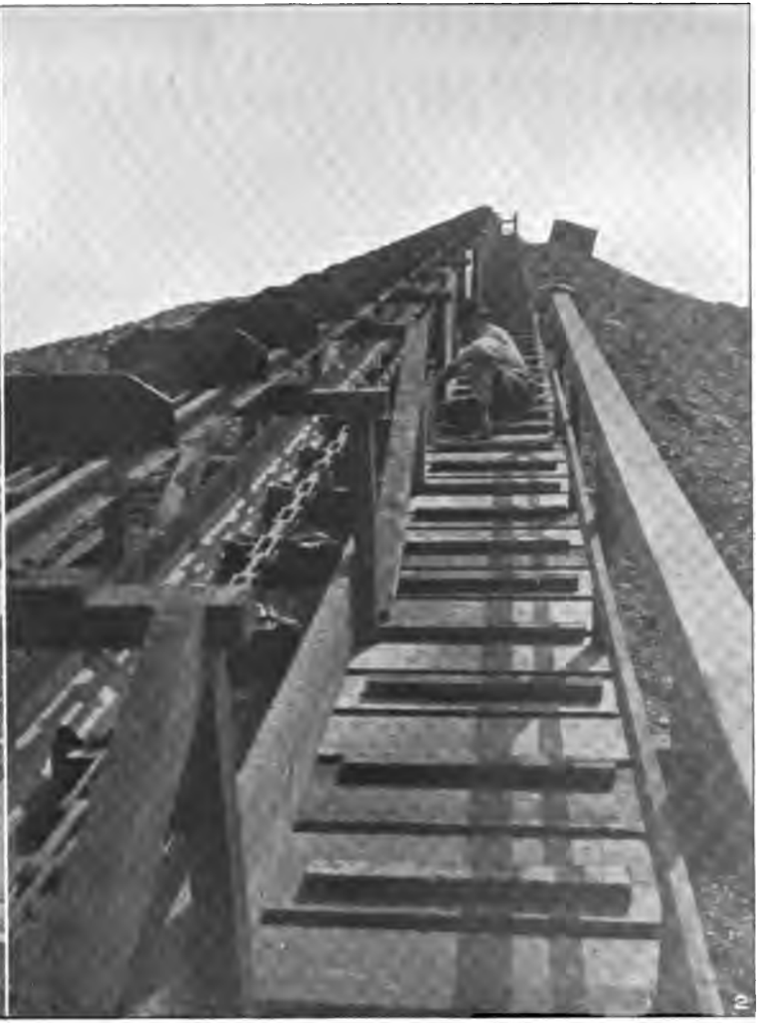
Horse Shoe Curve, Allegheny Mountains





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COAL INDUSTRY

1 Coal breaker and automatic slate pickers in action in the anthracite mines, Scranton, Pa.

2 Looking up a conveyor line which takes rock and slate from the separating machines to the top of a mountain of refuse at one of the big mines in Pennsylvania

West Virginia between them produce approximately one-half the total output and there are no indications of the exhaustion of the stores of this ideal fuel. The extraction of gasoline by compression provides the distributors of natural gas with a new source of revenue. Pennsylvania gas is exceptionally rich in carbo-hydrates, and one distributing company is extracting 50,000 gallons of gasoline per day. Since the discovery and development of the Lake Superior and Alabama iron mines Pennsylvania has lost its pre-eminent position as a producer of iron ore. Its output in 1915 was 367,056 tons, about .003 of the total for the United States. The value of stone quarried in this State in 1915 was $9,310,397 (No. 1 in United States) classified as follows: Limestone, $6,367,116 (No. 1 in United States); slate, $2,892,358 (No. 1 in United States), and sandstone, including bluestone, $1,253,994 (No. 2 in United States). Marble, trap-rock and granite make up the rest. Of the total about $2,750,000 in value consisted of crushed stone for ballast, concrete and road material. Portland cement, though in a sense an artificial product — consisting of a mixture of calciferous stone or marl and silicious earths — pulverized and calcined — can be successfully and profitably produced only in localities where minerals containing the required ingredients are found in juxtaposition and in adequate quantity. The region between Cementon, in Lehigh, and Siegfried's Bridge, in Northampton County, Pa., and Phillipsburg, N. J., is the chief centre of cement production in the United States. Nearly the whole output of the country in 1882 was produced in this region. In 1915 the output of the entire country was 172,706,588 barrels, of which number 56,837,391 barrels, or nearly one-third, came from the Pennsylvania fields. The marls and other earths used in the production of cement nearly all contain potassium silicates and by slight alterations in the furnaces about 5 per cent of potash is obtained from this material in the process of calcination. Southeastern Pennsylvania produces in considerable quantities combined iron and chromium ores, hematite, magnetic iron and corundum. According to the report of the State Secretary of Interior the mineral output in 1916 had a realized value of $1,357,829,836.

Forest Products.— Until 1876, when the supply of white pine in this State had become nearly exhausted by the wasteful methods which marked the decade ended in 1870, the timber of Pennsylvania was accounted one of the most valuable of its natural resources. As early as 1810 there were sawed in the State 73,847,640 feet of lumber. Since 1838 Williamsport has been, as it still is, the centre of the lumber industry. Hemlock, once despised, has become the principal variety of timber now cut in this State and constitutes 73 per cent of the entire product of lumber. Hemlock is still found in considerable quantities in northern Pennsylvania, though its exhaustion would be a matter of only a short time if the measures adopted to prevent and discourage waste should fail. Oak, white pine, poplar and spruce rank next to hemlock in importance in the order named. Practically all the chestnut has been killed by the blight and the white pine is menaced by the blister rust. The State still ranks fourth in the production of lumber, the value of its planing-mill output in 1914 having been $24,862,000 — about 8 per cent of the total for the United States. Of the four sawmills in the United States which produced more than 100,000,000 feet, board measure, this State contained one. Since 1901, when the Forestry Department was created and the Reservation Commission was authorized to purchase land "that the State ought to possess for forestry preservation," about 1,000,000 acres of mountain land have been acquired and made into inalienable State reservations. The protection of forests from fires caused by negligence has been the object of considerable legislation, and timber culture is being encouraged by large rebates from taxes.

Agriculture.— The soil of the State, except in the mountains, is everywhere fertile, and even where least adapted to agriculture is suitable for grazing. The southeastern part is excellent for growing cereals. The total farm acreage has not increased greatly since 1850, but the number of farms has grown over 75 per cent. The value of improved farms in the last census year was $1,253,274,862 as compared with $1,051,627,173 in 1900. This represented about 25 per cent of the assessed value of real property in the State. Of the 218,394 farms enumerated 163,587 were cultivated by their owners. The cereal crops raised in 1916 (a short year) were 26,125,000 bushels of wheat; 35,303,000 bushels of oats; 56,550,000 bushels of corn; 3,780,000 bushels of buckwheat (first in United States); 4,420,000 bushels of rye. There were produced also 19,040,000 bushels of potatoes, 5,208,000 tons of hay and 49,096,000 pounds of tobacco. Flour and gristmill products in 1914 were of the realized value of $43,626,000, which was exceeded only by Minnesota and New York. The State excels in dairy and market garden products and in the production of butter ranks second of the United States. The 980,000 milch cows counted in 1917 yielded 575,000,000,000 gallons of milk. There are generally more than 10,500,000 chickens over three months old on the farms of the State and nearly 70,000,000 dozen eggs are produced a year. There were 596,000 horses on farms in 1917; 48,000 mules and 664,000 cattle. The stock-raising industry remains stationary. The State department of agriculture is making efforts to prove the profitableness of raising beef and latterly the raising of sheep for wool has received encouragement from private associations and the passage of a stringent Dog Law.

Fisheries.— The most valuable fisheries of Pennsylvania are the shad fisheries of the Delaware. The Susquehanna, once famous for its shad, has been depleted by the employment of fish baskets, the building of dams and other injurious and wasteful practices. The annual catch of shad in the Delaware has recently averaged in value $500,000; that of the Susquehanna does not exceed $30,000 in the best years and is generally much lower. Delaware sturgeon are verging on extinction; efforts to give protection to the species by interstate legislation and by restocking the streams have not met with much success.

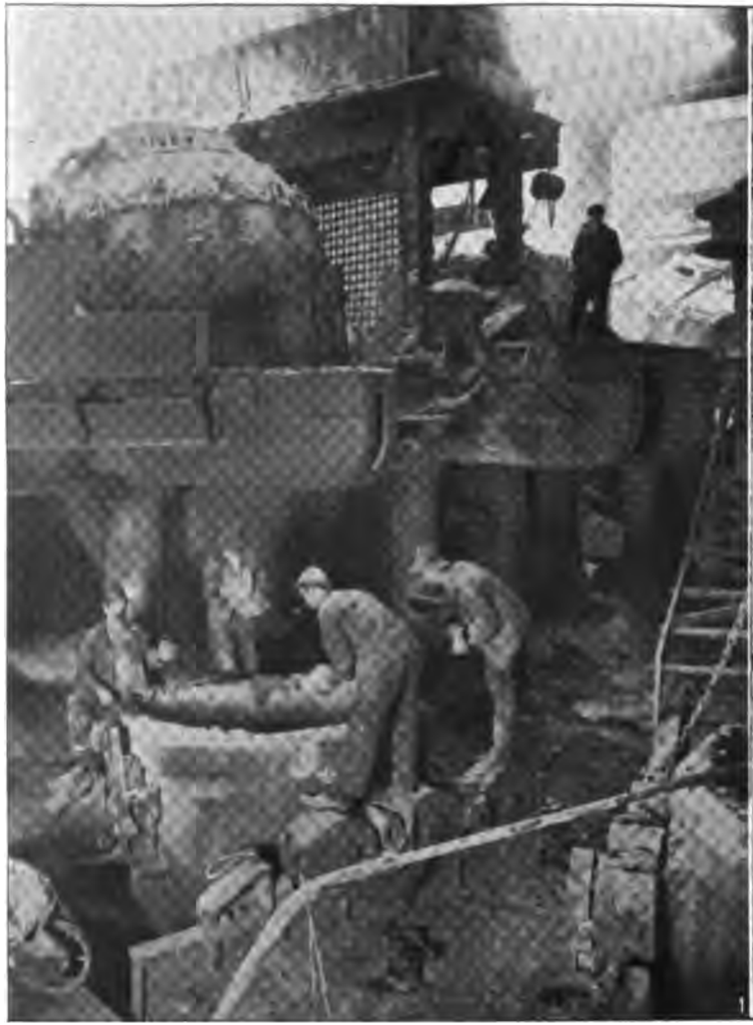
Manufactures.— From a very early period Pennsylvania has held the first rank as an iron producer in America. According to a publication dated 1692 a small quantity of iron had even then been made in the colony; in 1727 it exported 274 tons of pig-iron to England and in 1756 it was spoken of as the most advanced of American colonies in regard to its iron works. Berks County was the earliest seat of the industry, where Thomas Rutter, apparently a German, erected a forge on Manatawny Creek, three miles above Pottstown, in 1716. Beginning with 1788 the industry was developed to a considerable degree in the Juniata Valley and in 1790 a blast furnace was erected in Fayette County, which remained the main source of supply of the Ohio and Mississippi valleys for many years. Not until 1859 was the manufacture of pig-iron successfully established at Pittsburgh, although that city had produced considerable quantities of steel since 1813. The tremendous growth of the industry, however, dates from 1876. Allegheny County now produces 50 per cent of the pig-iron and 65 per cent of the steel manufactured in this State. The pig-iron produced in the State in 1909 amounted to 10,918,824 gross tons, which was about two-fifths of the total output of the United States. This represents an increase of 50 per cent, within the limits of a decade. The annual capacity of the blast furnaces of the entire country in 1914 was 44,405,000 gross tons; the capacity of the furnaces of Pennsylvania in that year was 17,858,000 gross tons — rather more than two-fifths of the total — and in obedience to an abnormal demand they have been recently run as nearly as possible to capacity. The production of rolled iron and steel in Pennsylvania (excluding that of the tin-plate works) was approximately 3,300,000 tons in 1890, 5,500,000 tons in 1900 and 9,000,000 tons in 1910, showing an increase of 173 per cent in a period of 20 years. From these data some idea may be obtained of the growth of the steel and iron industry in Pennsylvania within less than a generation. The production of tin and terne plates, a new industry in 1890, was valued at $35,283,360 in 1905. In 1914 the value of this product for the entire country was $68,343,000, of which the State produced $36,796,000. The foundry and machine-shop products of the State were valued in 1900 at $127,292,440, which was nearly twice the value of the output for 1890. In 1910 their value was $210,746,257, more than thrice that of 20 years previously. More than one-half the total number of locomotives built in the United States come from the shops of this State and the Delaware River at Philadelphia has become by far the greatest ship-building centre the world has ever seen. The second in importance of the industries of the State is the manufacture of textile fabrics, its output of silk, woolen, worsted and cotton goods of all kinds (clothing excluded) amounting in value in 1890 to $134,001,269, in 1900 to $158,782,087, and in 1914 to $221,645,000. Pennsylvania ranks second in the production of carpets, with 33 per cent of the entire product of the country; first in the production of thrown silk and pile fabrics of that material, with 35 per cent of the total; second in the manufacture of knit goods (especially hosiery, in respect to which it stands first) with 23 per cent of the total; second in the production of woolen and worsted goods, in which it is exceeded only by Massachusetts, whose output is approximately one-third as against Pennsylvania's one-sixth, of the total for the country. The German colonists of 1683 are credited with having introduced the manufacture of hosiery in this country; in 1810 there were manufactured in the State 107,508 pairs of stockings; in 1858 there were 700 hand frames in operation, and, indeed, the making of hosiery and other knit goods was a household industry in Germantown and vicinity down to quite recent times. The exhaustion of the hemlock forests of southeastern New York some years after the Civil War caused the tanners to turn their attention to central and northern Pennsylvania, and a great development of the leather industry followed; in 1900 the State ranked first in the tanning and finishing of leather, with products valued at $55,615,000 or 27.3 per cent of the whole product of the country. In 1914 the State was still far in the lead in this industry, with products of the value of $85,253,000, nearly 25 per cent of the product of the entire country. This State has also long led all others in the manufacture of glass, having produced 51.8 per cent of the total in 1870 and $22,011,130 worth or 38.9 per cent of the vastly larger total in 1900. In 1914 the State's output was valued at $39,798,000, nearly one-third the total for the country. The industry is carried on chiefly in the region of Pittsburgh, stimulated by the abundant supply of coal and natural gas, of fire-clay suitable for furnaces and the glass sand of unexcelled quality found in Fayette and Juniata counties. The first glass house west of the Alleghanies was built in 1797 by Albert Gallatin at New Geneva on the Monongahela River.

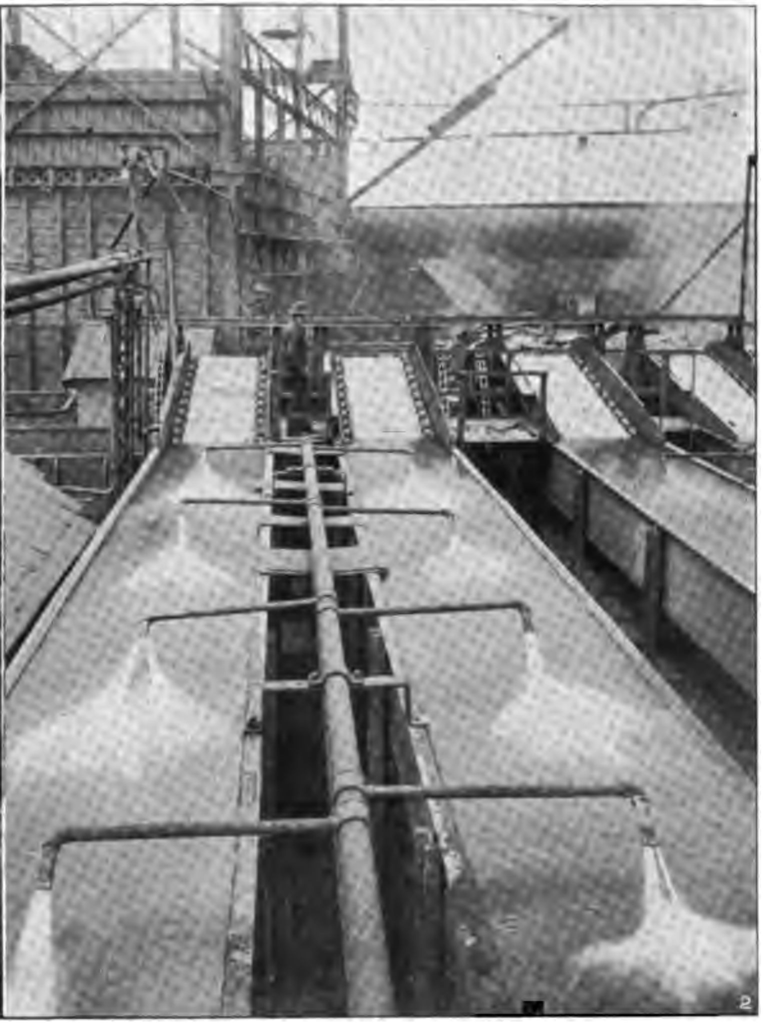
The following statistical tabulation of all manufacturing industries of Pennsylvania shows the growth thereof during a recent and comparatively normal period of five years.

	1904	1909
Persons engaged	855,392	1,002,171
Wage workers	763,282	877,543
Capital	$1,995,837,000	$2,749,006,000
Services	441,230,000	566,524,000
Salaries	73,269,000	110,897,000
Wages	367,961,000	455,627,000
Cost of material	1,142,943,000	1,582,560,000
Value of product	1,955,551,000	2,626,742,000
Value added by manufactures	812,608,000	1,044,182,000

The value of the product in 1914 was $2,832,349,437.

Commerce and Navigation.— The Allegheny and the Monongahela are both navigable about 60 miles from their junction at Pittsburgh, the latter by the aid of locks and slackwater basins. The Ohio from the earliest times and down to the beginning of the railroad era was the highroad of immigration from the East to the Mississippi Valley and continues to be a busy thoroughfare of steamboat traffic. The Delaware is navigable from the sea to Trenton and has great depth along the water front of Philadelphia. The shoals in its lower course have been removed, a channel 25 feet deep at mean low water has been dredged to the sea and a further deepening of the same to 35 feet is projected. The Schuylkill is navigable for large vessels about six miles from its mouth at Girard Point, Philadelphia, and for steamboats (with the aid of dams and locks) as far as Reading. The water of the Delaware does not become brackish until some distance below Wilmington, Del.; Philadelphia, therefore, is





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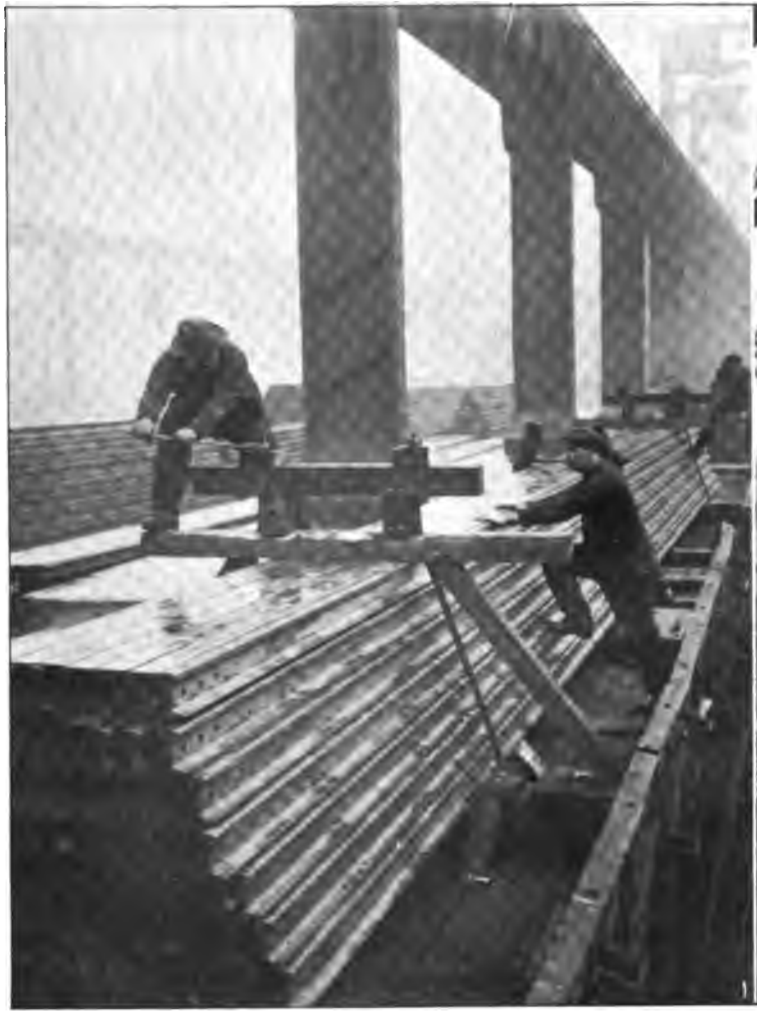
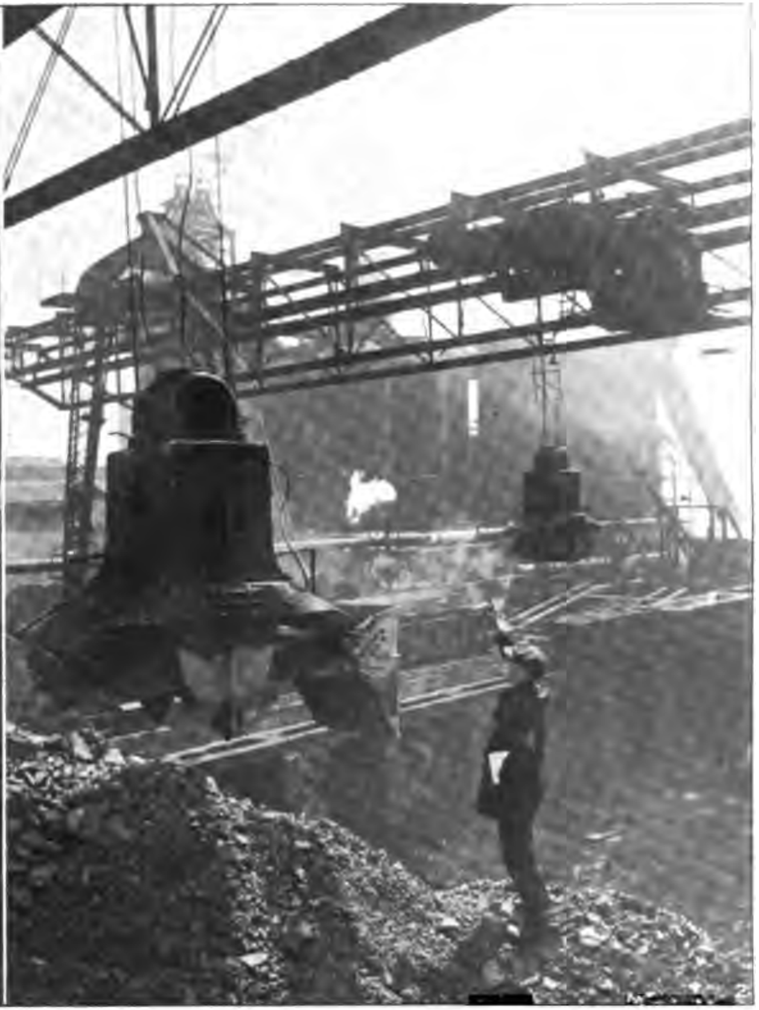
STEEL INDUSTRY

1 Putting clay lining in Bessemer converter

2 Pigs going into cooling troughs





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STEEL INDUSTRY

1 Fastening rails on cars for shipment

2 Mammoth ore buckets at work in a big steel mill

unique in the possession of a deep fresh water harbor within easy reach of the ocean. In 1916 the imports at the port of Philadelphia were valued at $95,801,175 and the exports at $193,495,296. Most of the canals of the State have fallen into disuse, though the Lehigh and Delaware Canal carries stone, bricks, cement and coal in limited quantities. The inland waterborne commerce of the State is conducted mainly on the Delaware and Ohio rivers, while the frontage on Lake Erie gives access to the commerce of the Great Lakes. The Delaware and Raritan and the Chesapeake and Delaware canals now afford, though inadequately, interior water communication with New York, Buffalo and Boston, on the one hand, and Baltimore and the South on the other — and the improvements projected and partly carried out open up incalculable possibilities. There are 148 steam railway companies operating lines in Pennsylvania; the greater part of the carrying business is conducted, however, by 12 railways; the Baltimore and Ohio, the Buffalo, Rochester and Pittsburgh, the Central Railroad of New Jersey, the Delaware, Lackawanna and Western, the Erie, the Lake Shore and Michigan Southern, the Lehigh Valley, the New York Central and Hudson River, the Northern Central, the Pennsylvania, the Pennsylvania Company, the Philadelphia and Reading, and the Pittsburgh, Cincinnati, Chicago and Saint Louis. Of the foregoing the Northern Central, the Pennsylvania Company and the Pittsburgh, Cincinnati, Chicago and Saint Louis form part of the Pennsylvania system. The Central of New Jersey, the Delaware, Lackawanna and Western, the Erie, the Lehigh Valley and the Philadelphia and Reading carry practically all the product of the anthracite mines to market. The railway mileage of the State, according to the report of the Secretary of the Interior for 1916, consisted of 9,187 miles of main line and 7,931 miles of branches and spurs, a total of 17,118 miles. In 1860 the total was 2,598 miles. There were on 16 Dec. 1916, according to the same report, 4,384 miles of electric railways in operation within the State. Continuous or connecting lines afford means of communication northward from Chester and Philadelphia to Bethlehem, Scranton, Easton and the Water Gap, and connections can be made via Trenton to New York and the Eastern States.

Banking.— The segregation of the banks of western Pennsylvania with those of the Federal Reserve District of Cleveland has made the consideration of the national banking resources by States unprofitable. The transactions at all the clearing houses within the State for the year ended 30 Sept. 1916 amounted to $15,895,707,000. The combined clearings at Philadelphia, Pittsburgh and Scranton for the year ended 30 Sept. 1910 amounted to $10,470,000,000, approximately. The transactions at Philadelphia increased from $7,760,336,900 in 1910 to $12,018,127,000 in 1916, about 70 per cent. The increase at Scranton was nearly 60 per cent, and at Pittsburgh about 30 per cent. The annual report of the State commissioner of banking of date 30 Nov. 1916 indicates:

	Number	Aggregate assets
State banks	192	$243,000,791 92
Trust companies	300	1,034,508,056 78
Savings institutions	11	270,614,648 40

The par assets of the banks of discount and trust companies — commercial paper and call loans against collateral — amounted at that date to approximately $478,000,000 and this capital stock and surplus to $316,882,886. There were on the same date 1,940 building and loan associations with 625,000 shareholders, with aggregate receipts for which they are accountable to members to the amount of $157,328,274.

State Finances and Government.— The revenues of the State are derived mainly from the following sources, yielding for the year 1916 approximately the following amounts:

Taxes on corporate stock	$16,500,000
Taxes on net earnings of corporations	4,500,000
Taxes on collateral inheritances	2,600,000
Licenses for motor vehicles	2,500,000

Receipts from licenses, official fees and miscellaneous special taxes made up the rest of the State's income, which amounted to $36,228,096. Real estate is not taxed for State purposes. The total disbursements were $34,962,445. There is practically no State debt. At the date of the latest available financial report there were outstanding overdue debentures, which had not been presented for redemption and on which interest has ceased to run, of the amount of $20,505. There are $500,000 of agricultural script bonds bearing 6 per cent. These sums are entirely covered, principal and interest, by cash in the sinking funds.

Pennsylvania's delegation in the Congress of the United States is composed of two Senators and 36 Representatives. The administration of the State's business and the execution of the laws is distributed between the executive department and numerous boards and commissions. The executive department consists of the governor, lieutenant-governor, secretary of state, attorney-general, auditor-general, State treasurer, secretary of internal affairs and superintendent of public instruction. The governor, lieutenant-governor, auditor-general treasurer and secretary of internal affairs are elected; the secretary of state, attorney-general and heads of other departments and commissions are appointed. The governor, whose term is four years, and who is not eligible for re-election, is invested with the veto and pardoning power. The former may be exercised with respect to single items of appropriation bills. No pardon can be granted by the governor except on recommendation of the lieutenant-governor, secretary of state, attorney-general and secretary of internal affairs, or any three of them; these officials constituting the board of pardons. The governor may refuse a pardon notwithstanding the recommendation of the board. The general assembly consists of two branches, the senate and house of representatives, and meets biennially in the odd numbered years at Harrisburg, which since 1810 has been the capital. The senators, 50 in number, are elected for four years in such manner that the terms of one-half the number expire every second year. The house contains 204 members elected for a term of two years. The compensation to members of the general assembly is $1,500 and 20 cents mileage for the regular biennial session and $500, besides mileage, for any extraordinary or special session. The judiciary is composed of the Supreme Court, the Superior Court, an Intermediate Court of

Appeals and the County courts. The Supreme Court has original jurisdiction in cases of injunction when a corporation is a defendant, and the judges thereof are ex officio justices of Oyer and Terminer; ordinarily, however, courts of Oyer and Terminer and Quarter Sessions are held by county judges, who also preside over Orphans' courts, and as judges of Common Pleas have jurisdiction in the first instance over all civil actions.

Population.— Pennsylvania has (United States Census Bureau estimate, 1915) a population of 8,383,992. No detailed information in respect to increase, race, nativity, sex distribution or status later than that given in the census of 1910 is available, however. The growth of population by decennial periods is indicated below:

1790	434,373	1850	2,311,786
1800	602,265	1860	2,906,215
1810	810,091	1870	3,521,951
1820	1,049,458	1880	4,282,891
1830	1,348,233	1890	5,258,014
1840	1,724,033	1900	6,302,115

The population in 1910 was 7,665,111, of which number 193,919 were negroes and 3,479 were of Indian, Mongolian and other non-European races. The native-born numbered 6,223,392, of whom 5,638,052, or 90 per cent, were born in the State. There were 4,418,277 of native parentage, 1,806,267 of foreign or mixed (foreign and native) parentage, and 1,442,374 foreign born. The rural population was 39.6 per cent of the total, which compares with 24.8 per cent for New Jersey, 21.2 per cent for New York, 10.3 per cent for Connecticut, 7.2 per cent for Massachusetts and 3.3 per cent for Rhode Island. Of the total population 3,942,206 were male and 3,722,905 female. There were 1,560,397 married men and 117,728 widowers, and 1,473,465 married women and 259,641 widows. The males 21 years of age and over numbered 2,309,026, of whom 741,610 were foreign-born whites, and of the latter 248,827 were naturalized, giving a voting population of approximately 1,812,000. The total vote cast in the State in the presidential election of 1916 was 1,297,097. The density of the population of Pennsylvania in 1910 was 171 to the square mile. The figures above given can, generally speaking, be brought down to date by increasing them 2 per cent for each elapsed year, which is the method adopted by the Census Bureau in making its estimates. The number of persons in Pennsylvania who were engaged in gainful occupations in the last two census years is shown below:

YEAR	Total number	Males	Females
1900	2,448,589	2,017,052	431,537
1910	3,130,681	2,525,245	605,436
Increase	28 per cent	25 per cent	40 per cent

Political Divisions.— The State is divided into 67 counties. The present constitution forbids special legislation, but the act of 25 June 1895 divides cities into three classes and, under the guise of general laws for each class, Philadelphia is legislated for by itself, being the only municipality answering the description of a city of the first class. The second class of cities includes those containing a population of 100,000 and less than 1,000,000 and covers Pittsburgh and Scranton. Cities of less than 100,000 population constitute the third class. The commission form of government has been made mandatory in this class by a general act. The cities of the third class with their population in 1910 follow:

Allentown	51,913	Johnstown	55,482
Altoona	52,127	Lancaster	47,227
Beaver Falls	12,191	Lebanon	19,240
Bethlehem	32,810	Lock Haven	7,742
Bradford	14,544	McKeesport	42,694
Butler	20,728	Meadeville	12,780
Carbondale	17,040	Monongahela	7,598
Chester	38,537	New Castle	36,280
Coatesville	11,084	Oil City	15,657
Connellsville	12,845	Pittston	16,267
Corry	5,991	Pottsville	20,236
Du Bois	12,623	Reading	96,071
Duquesne	15,727	Titusville	8,533
Easton	28,523	Uniontown	13,344
Erie	66,625	Wilkes-Barre	67,105
Franklin	9,767	Williamsport	31,860
Harrisburg	64,186	York	44,750
Hazleton	25,452		

The principal boroughs of Pennsylvania, some of which are more populous and otherwise more important than many of the incorporated cities, are given below, with counties where located and population at the last census:

Braddock (see North Braddock), Allegheny	19,357
Bristol, Bucks	9,256
Carlisle, Cumberland	10,303
Carnegie, Allegheny	10,009
Chambersburg, Franklin	11,800
Columbia, Lancaster	11,454
Conshohocken, Montgomery	7,480
Darby, Delaware	6,305
Dunmore, Lackawanna	17,615
Farrell (South Sharon), Mercer	10,190
Greensburg, Westmoreland	13,012
Homestead, Allegheny	18,713
Mahonoy City, Schuylkill	15,936
Monessen, Westmoreland	11,775
Mount Carmel, Northumberland	17,532
Nanticoke, Lucerne	18,877
Norristown, Montgomery	27,875
North Braddock, Allegheny	11,824
Old Forge, Lackawanna	11,324
Phoenixville, Chester	10,743
Plymouth, Lucerne	16,996
Pottstown, Montgomery	15,599
Punxsutawney, Jefferson	9,058
Shamokin, Northumberland	19,588
Sharon (see Farrell), Mercer	15,270
Shenandoah, Schuylkill	25,774
Steelton, Dauphin	14,246
Sunbury, Northumberland	13,770
Warren, Warren	11,080
Washington, Washington	18,778
West Chester, Chester	11,769

Charities and Correction.— Provision is made for the care of the criminal, indigent, insane and other defective and dependent persons in numerous State institutions, under the general supervision of the board of public charities. The correctional institutions, aside from the county jails, are the Eastern and Western penitentiaries, the former at Philadelphia and the latter at Pittsburgh; the State Industrial Reformatory at Huntington and the Reform School at Morganza. The Philadelphia House of Refuge, the male department whereof is at Glen Mills, Delaware County, though a local institution, receives State aid and accepts commitments from all counties. The contract system was abolished by law in 1881, and the inmates of prisons and reformatories are required to be employed "in behalf of the State" or "in behalf of such institutions." The penitentiaries are supported in part by appropriations from the State treasury. The other needed revenues are derived from the labor of convicts, profits of manufacturing, payments by the United States for the support of Federal prisoners and by the counties to make good any deficiency of support by labor of their convicts. The convict inmates of all correctional institutions, workhouses, county jails, the Industrial Reformatory, the Eastern and the Western penitentiary, at the date of the latest officially published reports were 9,923. The House of Refuge at Glen Mills had 1,186 and the Reform School at Morganza 500 inmates. The population of the almshouses was 17,802. The State hospitals for the insane, five in number, and located at Harrisburg, Danville, Norristown, Warren and Dixmont; the State asylum for chronic insane at Wernersville; the Homeopathic State Hospital at Rittersville and the State Hospital for the Criminal Insane at Fairview at the date of the latest published official report held 10,876 patients. The county-care hospitals held 7,919 insane patients; there were 832 in private hospitals and sanatoria and about 150 in almshouses and jails. The number of insane persons cared for in these various institutions was 19,800, of whom 10,530 were males and 9,270 females. Institutions for the feeble-minded at Polk, Spring City and Elwyn care for 3,435 defectives; four institutions for the deaf and dumb give instruction in oral speech and other training to 970; there are 336 inmates of institutions for the blind, 19,145 in home for children and the aged and friendless, 10,910 in State and private hospitals and 525 in sanatoria. The total population of the correctional and charitable institutions of Pennsylvania at date of the latest official report was 64,732. It is the policy of the State to give liberal aid to private charities and the money grants considerably exceed $2,000,000 a year. The unsystematic, haphazard manner in which the appropriations are distributed and the multiplication of applicants for State bounty lay open the present method to just criticism. There remain to be mentioned as State institutions the five hospitals for injured miners — one in the anthracite region, one in the middle field and three in the bituminous coal fields — and, finally, the Soldiers' and Sailors' Home at Erie.

Education.— The system of public instruction of the State dates from 1834, when the Common School Law was passed. The system is under the direction of the State superintendent. There are 2,582 school districts, each district generally comprising a township. The directors of the district assess the local rates. The supervision of instruction is by county superintendents and their assistants. The more important of the third-class cities have their own superintendents and the great cities have autonomous systems under local boards of education. The total number of public schools in the States is 40,655. Of these 331 are first-grade high schools, 275 second-grade high schools and 368 are third-grade high schools. There are 66 county superintendents, 79 assistant county superintendents and 123 district superintendents. There are 42,727 teachers, 9,163 males with salaries averaging $68.63 per month, and 33,564 females, whose monthly stipends average $50.55. The whole number of pupils for the school year ended 3 July 1916, was 1,504,794. Attendance at school between the ages of 6 and 14 years is compulsory. The constitution of 1873 requires the general assembly to appropriate not less than $1,000,000 a year to the common schools; the sum regularly appropriated is over $7,000,000, besides $300,000 for free tuition of students at the State Normal School and $250,000 for other purposes. The total expenditure for the entire system in 1916 was $61,670,951. Manual and vocational training have become features of prime importance in public instruction in Pennsylvania. Boys and girls between the ages of 14 and 16 who leave school to go to work are required to attend school not less than eight hours a week. For these, continuation classes are provided, which are located when feasible at the industrial plants where the pupils are employed. More than 30,000 pupils attend private schools and academies; there are more than 3,000 on the average in attendance in manual training and trade schools; more than 7,000 attend business colleges and more than 5,000 receive instruction at collegiate and other institutions for orphans. There are in the State 16 theological seminaries, seven medical colleges, four colleges of pharmacy, five dental colleges and four law schools. The Pennsylvania State College is one of the "land grant" colleges founded under the act of Congress of 1862. The names of the private collegiate institutions in the State, with their religious denominations, if any, are given in the following table:

NAME OF INSTITUTION	Denomination
Allegheny College, co-ed	Methodist-Episcopal.
Bryn Mawr, female	
Bucknell University, co-ed	Baptist.
Dickinson College, co-ed	Methodist-Episcopal.
Franklin and Marshall College	Reformed Ch. in U. S.
Geneva College, co-ed	Reformed Pres.
Grove City College, co-ed	
Haverford College	Friends.
Lafayette College	Presbyterian.
Lebanon Valley College, co-ed	United Brethren.
Lehigh University	
Moravian College and Theological Seminary	Moravian.
Muhlenberg College	Lutheran.
Pennsylvania College, co-ed	Lutheran.
Pennsylvania Military College	
Saint Vincent College and Seminary	Roman Catholic.
Susquehanna University, co-ed	Lutheran.
Swarthmore College, co-ed	Friends.
Thiel College, co-ed	Evangelical-Lutheran.
University of Pennsylvania, co-ed	
Ursinus College, co-ed	Reformed Church.
Villanova College	Roman Catholic.
Washington and Jefferson College	Presbyterian.
Waynesburg College, co-ed	Cumberland Pres.
Western University of Pennsylvania, co-ed	
Westminster College, co-ed	United Presbyterian.
Wilson Female College	Presbyterian.

Newspapers and Other Publications.— In 1900 there were in Pennsylvania 1,795 establishments engaged in printing and publishing with 16,991 wage-earners and products valued at $36,455,629. In 1914 the number of establishments was 2,352, the wage-earners employed numbered 23,012, and the products had increased in value to $77,889,000. The first printing press in the State was erected at Philadelphia in 1686, the first paper mill in the United States was established at Germantown in 1693. Franklin in 1787 stated that he was interested in the establishment of 18 and that there were then in operation 48 such mills in the State. In the middle of the 18th century there were some lively political wars of words carried on in the province and pamphlets were as numerous here as sermons in New England. In 1810 it was estimated that half a million volumes were printed annually at Philadelphia and for half a century after the Revolution as it had been for half a century before, this city was undoubtedly first in the printing industry. The first daily paper in the United States was established here in 1784. By 1810 the number of newspapers had increased to 73, of which eight were dailies — a larger number than published in any other city of the country at that time. The output of the periodical press in 1914 was valued at more than $52,000,000 (2d in United States) and the aggregate circulation per issue of all publications, according to the most recent information obtainable, was 19,674,336 copies, classified as follows:

PUBLICATIONS	Number	Aggregate circulation per issue
Daily	1,520	2,924,306
Sunday	223	1,481,282
Weekly	847	5,319,021
Monthly	253	6,107,571
Quarterly	97	3,516,933
Semi- and tri-weekly	52	243,089
All others	21	82,124

HISTORY.

The Swedes Colony.— The earliest settlements of white men on the western shore of the Delaware River were those of the Swedes. Though Henry Hudson, in the service of the Dutch East India Company, had turned the prow of the *Half Moon* into Delaware Bay in 1609; though Cornelius May, a Dutch navigator, in 1616 explored the bay and river, giving his own name to one and the name of a Frisian town (Hindlopen) to the other of the outer capes; though the Dutch West India Company in 1623 formally took possession of South River, now the Delaware, built Fort Nassau on the present site of Gloucester, N. J., and later on, Fort Beversrede on the Schuylkill — the Dutch came merely as traders. The Swedes were real colonists, Gustavus Adolphus, the Swedish champion of Protestantism in Germany, is believed to have entertained a rather large scheme of colonization in America; but the king's preoccupation by his contest with the German emperor hindered the development of the plan, and his death at Lützen ended it. In a more modest form the project was taken up by Chancellor Oxenstierna and in December 1637 two small vessels filled with Swedes and Finns set sail for America. The expedition was led by Peter Minuit, who had been director-general in the plantation of New Amsterdam. Heedless of the protests of either the English in Virginia or the Dutch in New Netherlands, the doughty Peter proceeded to build a fort on the present site of Wilmington and buy from the Indians all the west shore of the South River from Bombay Hook to the Schuylkill. He was drowned in the West Indies in the following year and was succeeded by one Hollander, who brought another ship load of colonists and enlarged the boundaries by purchasing the west bank up to Trenton Falls. In 1642 came John Printz, with two war-ships and an armed transport and fortified with a commission to administer justice, maintain the Lutheran religion and defend New Sweden against all comers. Printz, who was a native of Holstein, appears to have been a person of distinction. He had been a lieutenant-colonel in the Swedish service and lived to become a general. He was accompanied by 54 German families, mainly from Pommerania. He strengthened Fort Christina (Wilmington) and established another, armed with cannon, on Tinicum Island; where he also erected for himself a mansion and pleasure house and built a yacht. The settlers cultivated tobacco, wheat, rye and barley; they raised cattle and had a flourishing mill on Cobb's Creek. Fort Casimer, which Peter Stuyvesant had established in the locality where New Castle, Del., now stands (in order to overawe the Swedes), was captured by Printz and enlarged. At last, in 1655, while Governor Printz was absent from the colony, the Dutch sent an overwhelming force of 750 men down from New Amsterdam and the Swedes capitulated. The colony henceforward shared the vicissitudes of New Netherlands; it was captured by the British in 1664, recaptured by the Dutch 10 years later, and finally ceded to Great Britain by the treaty of peace signed February 1675, when it was annexed to the domains of the Duke of York in America. The colony included about 200 families and, a few years before the arrival of Penn, received some accessions from the English Quakers who had begun to settle in West Jersey in 1675. «The Three Lower Counties on the Delaware» were transferred to William Penn by the Duke of York in 1681 and were attached to Pennsylvania until 1701, when Penn consented to a separate assembly for the «Territory,» by which name the counties became known. The social and political relations between «Territory» and «Province,» however, continued most intimate, even after the separation; it was not unusual for the residents of one colony to sit in the legislature of and to occupy high official positions in the other down to Revolutionary times, when the «Territory» became the State of Delaware.

Penn's Experiment in Government.— «This day my country was confirmed to me under the great seal of England, by the name of Pennsylvania,» wrote Penn, in a letter of date 5 March 1681 (the charter bears date March 11th). He had proposed to name it New Wales, «being as this a pretty, hilly country»; and when this was objected to, he suggested Sylvania. «They added Penn to it,» he continued, «and though I much opposed it and went to the King to have it struck out, he said it was past, and would take it upon him; nor could twenty guineas move the under Secretary to vary the name; for I feared lest it should be looked on as a vanity in me and not as respect in the king, as it truly was, to my father.» The charter, which was granted partly in extinguishment of a debt due from the King (Charles II) to Admiral Penn, the father of the first proprietor, conveyed a tract lying between the 40th and 43d parallels of north latitude and extending from the Delaware River westward five degrees of longitude. Beside making Penn the sole and absolute proprietor of the land it invested him with power to frame the laws, subject to the consent of the freemen, to appoint judges and other officers, impose taxes, suppress piracy and levy troops. To the British Parliament was reserved the right to lay imposts and to the Privy Council Committee on Trade and Plantations the right to annual provincial laws, which were required to be submitted to that body within five years after enactment. The Proprietor thus had an absolutely free hand for half a decade, at least, to conduct his «holy experiment.» To the men of the tail end of the 17th century, still in the throes of a sanguinary religious conflict which had devastated Europe for more than 150 years, the idea of founding a state without an established church, and wherein all creeds were to be placed on a footing of complete equality, must have appeared as hare-brained as do the tenets of scientific nihilism to the average citizen of our times. The notion of establishing in a howling wilderness an unarmed community, conscientiously obedient to the doctrine of non-resistance, must have seemed a manifestation of insanity. What could be expected of such a community but that it would be annihilated by its savage neighbors or be wrecked by internal anarchy? But, nothing daunted, Penn proceeded with framing a constitution for his colony. His magnetic personality had enabled him to smooth out differences and preserve harmony in the intensely individualistic sect to which he belonged and he doubtless, imagined he could sway a Quaker assembly with like success. His expectations to permanently reside in and to personally superintend the upbuilding of his model State were doomed to be disappointed, however. He arrived at New Castle in the ship *Welcome* on 27 Oct. 1682, and in less than two years he was called back to England by the state of the controversy over the Maryland boundary. Political and financial complications detained him there until 1699. His departure was the signal for the outbreak of dissensions. Penn's first «Frame of Government» was a compound of feudal, monarchial, aristocratic and democratic elements. The proprietor was the lord paramount of the soil and all the colonists were his tenants; he claimed the right not only to appoint the judges, but of organizing the courts; the assembly had the power to assent or to reject proposed laws, but the initiative in legislation as well as supreme judicial and administrative authority was vested in the council, which was thus a copy in miniature of the British House of Lords and Privy Council rolled into one. The assembly chafed under the restrictions placed upon its action. It could not inaugurate but it could frustrate legislation. It impeached its speaker for no apparent reason than that he was more reasonable than «the witless zealots» who made «a monkey-house of Mr. Penn's Assembly» — the quotations are from a letter of Penn's deputy, Governor Blackwell. A clerical adventurer named Keith about this time was threatening to cause a schism in the Quaker brotherhood and the colony resounded with shrill invectives from the orthodox — for Keith, though a man of no principles, was eloquent and had no equal in this respect in the province. Penn's friend, James II, the former Duke of York, had been deposed and William of Orange had succeeded to the throne. William well understood for what purpose his enemy Louis XIV had sent Frontenac back to Canada in 1691 invested with vice-regal powers; he determined to put the colonies in a condition to effectively defend themselves. Colonel Blackwell, an old Cromwellian soldier, whom Penn had appointed his deputy, perhaps with such a contingency in view, was unable to extract a penny of money from the assembly for military purposes. Two commissioners sent to Pennsylvania from New York at King William's command reported that the colony was prepared neither against an Indian attack from the west nor against the French privateers who infested the estuary of the Delaware. To the foremost warrior of that warlike age this seemed a trifling with fate. The Proprietary charter was revoked in 1692 and Governor Fletcher of New York instructed to take over the direction of affairs in Pennsylvania. On giving his promise to the Privy Council to «provide for the safety and security» of the colony, to transmit to the assembly the king's orders, and on expressing his assurance that the colony would «supply such quotas of men and defray such part of the charges as his majesty might deem necessary to preserve his dominions in North America,» Penn was reinstated in his proprietorship in 1694. During his second brief term of residence in the colony, from 1699 to 1701, Penn urged and secured the passage of laws to suppress piracy and contraband trade, a subtle distinction between police and military measures enabling him to reconcile his conscience to these enactments. He could not, however, prevail over himself to advocate the warlike policy imposed upon him by royal command; and his promise remained unfulfilled. A second, and probably final, revocation of his charter being impending Penn hurried back to England, as the event proved, never to return. By the sudden death of King William the charter was saved; but the assembly had been made to dimly comprehend that it represented a polity and not a denomination and, on the renewal of war with France in Queen Anne's time, voted money to the use of her gracious majesty — to be sure, with an artless effort to conceal the purpose for which it was granted. Less consideration was shown for the founder. «O, Pennsylvania, what hast thou cost me?» wrote Penn in 1705. «About £30,000 more than I ever got, two hazardous and fatiguing voyages and my son's soul.» The reference is to William Penn, Jr., a scapegrace, whose escapades had scandalized sober Philadelphia and who died shortly after a brief and boisterous career as member of the Pennsylvania council. Though pecuniary profit was the last thing considered by Penn, it certainly was not an unreasonable expectation that the colony would afford him an income commensurate with the sacrifices he had made. He had expended over £50,000, the greater part of his patrimony, in establishing the same. The quit-rent demanded for land was low, but the payments were spasmodic; the receivers were derided and occasionally maltreated. The sales of land up to 1710 amounted to 91,000 acres, bringing a total of £10,640. But the assembly exhibited supreme indifference to Penn in his financial distress. When reminded by the proprietor that he had received no support from the colony for 20 years an excise tax was ordered in 1700 for his benefit; but in the following year the income therefrom was directed to be paid into the public treasury. Disillusioned, and harassed by the fear that he would leave his family ruined, Penn entered into negotiations with the Crown to surrender his proprietary rights. A stroke of paralysis prevented the consummation of the agreement.

A Quaker Republic.— But the experiment in Quaker government was not wholly a failure. The last act of Penn before leaving the colony in 1701 was the promulgation of a new constitution. The assembly became the sole lawmaking power, the council an appointive advisory and executive body; the proprietor resumed the right of veto, which he had in the beginning and of his own free will renounced. David Lloyd, a Welsh Quaker, the best lawyer in the province, assumed the leadership of the popular party. He was an unscrupulous politician, a lover of power and a persistent personal enemy of William Penn; but in him the assembly found its master. Whatever else may be said to the discredit of David Lloyd it cannot be denied that he was an uncompromising democrat and made the assembly a workable political machine. Governor Evans (1704–09) spoke truly when he said that «the proceedings of the Assembly from the beginning of the century indicated a purpose to reverse the methods of government according to the English Constitution and to establish one more nearly resembling a republic in its stead.» When the House assumed the right to prorogue itself at will it became practically the most independent legislative body in the British Empire. Although the veto of the proprietor or his deputy governor was absolute, the assembly, holding the purse-strings of the province, was in the end able to get anything it seriously desired. As for the right of the Privy Council or their lordships of the Board of Trade to annul provincial laws, the assembly could, if it would, re-enact them; when they would stand good until again repealed — and this expedient the House did not hesitate to employ on occasions. After a struggle of nearly a quarter century between the assembly on the one side and the proprietaries and the British Privy Council on the other, over the organization of the colonial judiciary, the courts were finally organized (in 1722) substantially as first proposed by the House. The county courts, or courts of common pleas, were made the main depositories of judicial power; all cases, civil and criminal, were triable in the first instance by tribunals of the vicinity in which the cause of action arose. No provincial imitation of the English King's Bench could send forth a Jeffreys to hold bloody assizes, the local courts were not to be dominated by certiorari, mandamus and quo warranto, and their proceedings were reviewable, generally speaking, only on appeal of one of the parties to an action. To this day the judiciary system of Pennsylvania retains practically the organization thus provided under Lloyd's influence. The attempt to undermine the Quaker democracy by requiring all public functionaries to take oaths of office, and by compelling jurors and witnesses in judicial proceedings to be sworn, ended in failure, although the victory in this case involved a sacrifice of Penn's mild penal code. The scruples of the Quaker juries, however, continued to give assurance against the taking of human life as a penalty for petty crimes. «It is our great happiness,» said Andrew Hamilton, speaker of the assembly in 1739, «that instead of triennial assemblies, a privilege which several other colonies have in vain endeavored to obtain, ours are annual and for that reason less liable to be practised upon or corrupted. We sit upon our own adjournments when we please and as long as we think necessary and are not to be sent a-packing in the middle of a debate and disabled from representing our just grievances to our gracious sovereign. . . . We have no officers but what are necessary . . . and those generally elected by the people or appointed by their representatives. Other colonies swarm with unnecessary officers nominated by the governors, who make it a main part of their care to support them notwithstanding their oppressions. . . . Our foreign trade and shipping are free from all imposts except those small duties payable by the law of Great Britain. The taxes we pay for carrying on the public service are inconsiderable, for the sole power of raising and *disposing* money is lodged in the Assembly, who appoint their own treasurer and to them alone is he accountable. Such is our happy state as to civil rights.» In the constitution of 1701, as in all the previous «Frames of Government,» Penn had given the foremost place to the proviso for the unconditional equality of all religious creeds. The proviso was esteemed rather lightly by the assembly; they had «liberty enough for Englishmen,» and some would have preferred to disqualify all but Quakers. Even Penn's secretary, Thomas Logan, wrote to him that «most of us do not value it at so many pence.» Penn was ahead of his times, but liberty of conscience was doubtless one of his most beneficent legacies to the colony. Another, of the utmost advantage, was his Indian policy. Firmly convinced that the natives could be won by justice, he would permit no land to be opened to settlement without consent of the aboriginal occupants. In several instances the claims of five or six tribes asserting title to territory acquired by the proprietary from one of them were successively satisfied. The famous Treaty of Shackamaxon, however, involved more than a mere land purchase. In Penn's description of Pennsylvania he says: «We have agreed that in all differences between us, six of each side shall end the matter»; and from this and the Indian traditions it may be inferred that the compact was an arbitration treaty. Governor Byrd of Virginia, who certainly could be suspected of no predilections in favor of Quakers, in 1734 put his testimony on this subject in writing thus: «The truth is they have observed exact Justice with all the natives bordering on them . . . which has saved them from many wars and massacres, wherein the other colonies have been indiscreetly involved.» In this manner Penn and the Quakers contributed much to the security of the American frontier; as for Pennsylvania, down to Braddock's defeat, «she scarcely knew an alarm.» Peace, abundance and religious and civil liberty, were blessings which few if any other communities of that era enjoyed. Small wonder that the colony grew with unparalleled rapidity; it would have been strange if it had not. Within 20 years of the first settlement the province contained nearly 25,000 white settlers, besides 6,000 Indians and nearly as many negroes. By 1750 its capital city was the market centre for a population of probably 150,000. In 1723 about 85 vessels entered the port; its imports amounted in value to £16,000 and its exports to £90,000. By 1752 the ships annually visiting the port numbered 453, and its foreign trade had grown in value to £320,000.

German and Other Foreign Accessions.— From the first the Quaker community received non-English accessions. A company of Friends of Welsh nationality bought large tracts of land west of the Schuylkill. Such names as Merion, Bryn Mawr, Radnor and Cynwyd still proclaim the Welsh origin of these townships. The sale of land within their «Barony» to others than Welshmen evoked protests from these particularists and their «meetings» performed nearly all the functions of government, even ordering such matters as the establishment of ferries and the erection of line fences. But the purpose, if it ever existed, of maintaining a Welsh imperium in imperio was not long sustained. Their leading men soon took active parts in the political life of the province. The same vessel which brought over the Welsh in 1683 carried Francis Daniel Pastorius, the founder of Germantown and a signer, perhaps the originator, of the first American petition for the abolition of slavery. Pastorius and his company were German Quakers. The Mennonites had been hounded up and down the country from Lake Geneva to the North Sea for a century, when, falling in with Penn's missionaries and encouraged by letters from Pastorius, a party of them, headed by William Rittinghuysen, set out for Pennsylvania in 1688, joined the Germantown colony and were followed in time by nearly the whole body of the sect. To the Dunkers, who came to Germantown in 1719, belonged Cristopher Sauer, the printer of the first Bible in America in a European language. The Moravians, adherents of the pre-Lutheran reformer John Huss, had become almost annihilated in the religious wars of the 17th century. A remnant of the sect was given asylum on the estate of Count Zinzendorf in Silesia. This refuge was called Herrenhut (Shelter of the Lord), an almost literal translation into German of the name Bethlehem. Their noble protector found the means of transporting the Moravians to America. Georgia, their first stopping place, was abandoned for the more congenial surroundings of Pennsylvania; and here they were joined by Count Zinzendorf in 1734, who publicly renounced his title of nobility and led his little band to a new Bethlehem on the Lehigh. The Moravians, who were men of deep learning and refined manners, attained considerable success in their effort to civilize their Indian neighbors and to instil into their more backward kinsmen higher ideals of living.

All told the Germans in Pennsylvania in 1710 did not exceed 3,000 in number. Beginning with that year a tide of immigration set in which was to impress upon a large section of the Commonwealth characteristics that have persisted to the present day. The Palatines, as they have been called without sufficient regard for historical accuracy, were not the victims of religious bigotry; they belonged to regularly established churches, the Reformed and the Lutheran — wherefore they were called «church people» to distinguish them from the «Sects.» The cause of their emigration *en masse* is obscure. The devastation of their homes during a century of conflict, first, in the Thirty Years' War, by Swedes and Imperialists, and later by the armies of Louis XIV and his German, English and Dutch foes who made their country a common battleground; the hard winter of 1708–09 and inducements believed to have been held forth by the government of Queen Anne — all these probably contributed to the result. In 1709 from 12,000 to 15,000 of these wretched and half-famished people were gathered in London, sustained by public and private charity. Many died, a few returned to Germany, others were scattered to various parts of England; about 3,000 became settled in Ireland and a nearly equal number were given passage to America. The uncouth and destitute wanderers were looked upon with disfavor by the authorities at Philadelphia; they did not long trouble the latter with their presence, however, but pressing beyond the tracts occupied by the Quakers they took up lands mostly in Berks and Lancaster counties and in the Lebanon and Lehigh valleys, where their skill in husbandry soon made them fairly prosperous and contented. The German immigration into Pennsylvania exceeded in number all others in colonial times; in the year 1749 alone 12,000 landed at Philadelphia. «I remember,» wrote Franklin in 1753, «when they modestly declined intermeddling in our elections, but now they come in droves and carry all before them. Of the six printing houses in the province two are entirely German, two half German half English and but two entirely English. They have one German newspaper and one half-German. Advertisements intended to be general are now printed in Dutch and English. The signs in our streets have inscriptions in both languages and in some places only German. They begin of late to make all their bonds and other legal instruments in their own language, which are allowed good by our courts. . . . and I suppose in a few years interpreters will be needed in the Assembly to tell the one half of our legislators what the other half say.» At the outbreak of the Revolution the population of the State was about 300,000, and Franklin's remark that it consisted one-third of Quakers, one-third of Germans and one-third of miscellaneous and refractory elements was substantially correct. By this time the Swedes and Welsh had been merged with the English-speaking population; but the so-called Palatines constituted a seemingly impermeable mass. In the Revolutionary period they, conjointly with the Scotch-Irish Presbyterians, dominated the government. During the first quarter of the 19th century, and even later, the Germans held the balance of power in Pennsylvania politics, a fact to which the succession of early State governors with German names bears witness. Even at the present day many of the inhabitants of the German belt can speak no other tongue than «Pennsylvania Dutch»; and in a recent sensational criminal trial, when some of the witnesses were unable to give their testimony in any other language, neither judge nor jury nor the prosecutor nor counsel for defense required the services of an interpreter.

The Era of Franklin.— The sons of Penn by his second marriage were in almost every respect the opposites of their father. They had abjured Quakerism and entered the Church of England; they possessed none of his intellectual gifts and were parsimonious and grasping. Thomas Penn, who succeeded to the proprietorship by right of primogeniture, inaugurated his career by cheating the friendly Delawares. The latter had ceded a tract of land to the west of the Delaware River, extending from the latitude of Trenton northward as far as a man could walk in a day and a half; the new proprietor caused the distance to be measured off in a 36-hour relay race by two trained athletes. This transaction became known in history as the «Walking Purchase.» The quarrel was further embittered when the Delawares, who had threatened to defend their homes, were ordered off the land by their suzerains — the Six Nations of the Iroquois Confederacy — to whom the proprietors appealed. The colony now for the first time had a vindictive and savage foe on its frontier. Pennsylvania was but little affected by the third of the wars between France and Great Britain, in which the American colonies were more or less involved and which broke out in 1744. There was some apprehension from privateers in Philadelphia, and Franklin's appeal in his pamphlet, 'Plain Truths,' roused the people who were not Quakers to organize a volunteer force and to build and equip a fort on the river just below the city; there was some desultory fighting in the Indian borderland; Thomas Penn's deputy proclaimed the Delawares and Shawnees public enemies and magnanimously offered rewards for Indian scalps. The intelligence of the New England militia's expedition to Louisburg seemed like news from another continent. The assembly remained unmoved by Franklin's terrible description of a defenseless community, «subject to the wanton and unbridled rage, rapine and lust of negroes, mulattoes and others, the vilest of mankind,» such as constituted the crews of privateering vessels in those times. Many Quakers resigned their seats, however, and surrendered other official positions, being unwilling to serve under a government which had committed the sin of declaring war. The peace of 1748 endured only for a short time. The decisive conflict between France and England for colonial empire in America was drawing near. The Seven Years' War, in which Frederick of Prussia earned his title of «the Great,» and in which England under Pitt gained Canada and India, began in Europe in 1755; in America the gravity of the situation was recognized two years earlier. At the Congress of Albany in 1754 the Pennsylvania assembly was represented by Samuel Norris and Benjamin Franklin; the proprietary by John Penn. One of the main objects of the Congress was to deter the Six Nations, hitherto the strongest bulwark against the savage allies of France, from casting their lot with the enemies of the English settlers. That at such a time, when the American colonies were preparing to defend their very existence, the proprietors should have imperiled all for private gain seems incredible, but such was the fact. In the «Western Purchase,» which was consummated at the Albany conference, the Indians were deceived into conceding their favorite and jealously guarded hunting grounds, the boundaries being described by the compass, which they did not understand. Part of the Iroquois openly espoused the French cause; the remainder became lukewarm and unreliable friends. The disaster of Braddock threw the undefended colony open to the murderous onset of its now numerous native enemies. In the fall of 1755 the savages, after overrunning the outlying settlements, pressed through the passes of the Blue Mountains on the heels of the fleeing British regulars. Every post brought to the council at Philadelphia heartrending appeals for help; the assembly and the governor, acting under instructions from the proprietary, were deadlocked; no money bills could be passed. Troops of frontiersmen rode through the city threateningly brandishing their weapons; a party of Germans laid the corpses of their countrymen, scalped within 65 miles of the capital, at the door of the State House. The Quaker peace policy was denounced in unmeasured terms from the backwoods pulpits. On this occasion, however, the assembly did what it could. It had voted money to aid Massachusetts in the expedition to Cape Breton and, the grant having been vetoed, it had adopted the suggestion of Franklin to draw upon the Loan Office, as it had a right to do without the consent of the executive. There was not a stiver in the treasury of that institution, but an issue of interest-bearing bills of credit payable in a year served the purpose. The assembly was prepared to levy a tax to provide for the defense of the province, but the governor's instructions from the proprietary were to sign no supply bills unless the estates of the latter should be expressly exempted from taxation. «He who would purchase present security at the cost of essential liberty,» insisted Franklin on the other side, «deserved neither security nor liberty»; and so the deadlock continued until late in the fall of 1755. Intimidated at last by the indignation aroused in England by the reports of their meanness, the proprietors agreed to «donate» £5,000, approximately their share of the proposed levy. Under the pressure of necessity the assembly yielded the point, voted the money and left the proprietary estates untaxed. A volunteer regiment was speedily recruited by Franklin, who proceeded to the frontier with part of his force to supervise the construction of a line of forts. Blackened ruins everywhere told their fearful tale. The savages had not even spared their own kin; Gnadenhut, a settlement of Indians who had been civilized and Christianized by the Moravians, had been wiped out. The Moravians, themselves, though relieved from military service by special act of Parliament, were found by Franklin to be «in good posture for defense.» The trouble subsided gradually during 1756; the voluntary organization of the Scotch-Irish frontiersmen into companies of rangers had a good effect; the destruction of Kittanning in January 1757 by the Pennsylvania levies compelled the hostile Indians to retire behind the guns of Fort Du Quesne. A treaty of amity was concluded later in the year with the Delawares and Iroquois at Easton, and the Ohio Indians were persuaded by Moravian missionaries to give up the war. The French dismantled and abandoned their stronghold; when rebuilt it became Fort Pitt. So far as Pennsylvania was concerned the conflict was ended. There was to be a tragic epilogue to the French wars, however. Peace had scarcely been concluded between France and Great Britain in 1762 when the American frontier was again ablaze and the scalping parties of Pontiac ravaged all Pennsylvania west of the Susquehanna. Eight fortified outposts fell in a single day, though Fort Pitt was saved by Colonel Bouquet, who proved a better soldier than Braddock. Maddened by fear and by their sufferings a body of Scotch-Irish rangers, the «Paxton Boys,» so named for the principal settlement of their vicinity, fell upon the remnant of the Conestoga tribe — some 20 harmless people, who eked out a miserable existence by weaving baskets and binding brooms. Every man, woman and child of them was butchered. The expressions of horror in Philadelphia over the deed of blood evoked recrimination from the backwoods; treating with the heathen instead of exterminating them was pronounced ungodly, and the calamities which had come upon the province were declared to have been visitations in punishment of a sinful and irreligious policy. Here was a contrast, indeed, with the Quaker point of view. When the Moravian Indians, for better security, had been removed to Philadelphia the «Paxton Boys,» swollen by rumor to an army, swooped down on the city, vowing to annihilate the red-skinned Ishmaelites as well as anybody who dared defend them. In the excitement several hundred young Quakers joined the defenders, musket in hand. The affair fizzled out. It was Franklin again who relieved the situation. He interviewed the rioters, received their petition and induced them to disperse. But the backwoodsmen were able to point out the inconsistency of those who would fly to arms to protect Indian «heathen» and leave Christian white men exposed to the rapine of wolfish savages. With the return of peace the quarrel with the proprietary once more came to the fore. It was discovered that the «donation» of £5,000 was to be paid in driblets, as money could be extracted from tenants whose quitrents were in arrears. The proprietors at last shut off all remonstrances by announcing that they would receive none. This filled the measure. They had reserved the best land for speculative purposes, yet required property thus held for private gain to be relieved of all burdens, as though it were public domain. They would contribute nothing to the defense of the province, including their own possessions; yet they would not consent to a law to establish a militia unless they should have the appointing of the officers and thus control the force. They had constituted themselves as a non-resident and irresponsible cabal, whose secret instructions their deputy, the governor, was under bonds to carry out, and now they denied the right of petition, one of the most valued privileges secured to freeborn Englishmen by the Bill of Rights. The question submitted to the electors by the assembly in 1764, whether the king should not be requested to take over the government of Pennsylvania as a Crown colony, was answered affirmatively after the hottest political campaign the province had ever known. Franklin was defeated of re-election, but he was commissioned to present a petition of the assembly to the above effect to the king's council in London. The petition was duly presented, but was not pressed, other and graver issues having meanwhile arisen; but the revolt against the proprietary was a premonition of the coming revolution.

Boundary Controversies.— Colonel Markham, Penn's first deputy, had scarcely arrived at New Castle in 1681 when he became involved in a boundary dispute with Lord Baltimore. The 40th parallel, named in the royal charter as the southern boundary of Pennsylvania, was supposed to be the latitude of New Castle but to the consternation of Markham and the gratification of Baltimore it was found that the 40th degree ran to the north of the site of Philadelphia. The proprietor of Maryland also claimed title to all the western bank of the Delaware River up to his northern line. But a reservation in the Maryland charter, which excluded lands «previously settled,» saved the three southern counties for Penn — the Swedes' colony being held to constitute a previous settlement within the meaning of the grant. On other points the position of Lord Baltimore was apparently impregnable. He sent an armed force into the peninsula and established a fort on the Susquehanna near Columbia. At this point his proceedings were stayed by the Privy Council, but not until 1763, when it had been located and surveyed by two English surveyors, Mason and Dixon, was the divisional line between Maryland and Pennsylvania definitely fixed. It follows lat. 39° 43′ 26.3″ N. The Virginia claim, founded in part on the vaguely worded charter of that colony, had a more substantial basis in the grant by George II in 1749 to the Ohio Company of 500,000 acres on the «Forks of the Ohio» for the purpose of establishing a settlement as a barrier to the French. The company and the proprietors arranged a modus vivendi, however, and the action of Lord Dunmore, governor of Virginia, who assumed control of nearly the whole of Westmoreland County, caused Fort Pitt to be rebuilt, and on 25 April 1774 issued a proclamation commanding the militia to «repel the insults of Pennsylvania» and the inhabitants to decline payment of quitrents for land «freely given» by Virginia, was evidently intended to provoke dissensions between the colonies then falling into line in united opposition to the British Crown. In 1779 the differences between Pennsylvania and Virginia were amicably settled by a joint commission. The determination of the northern boundary was begun when David Rittenhouse, who was commissioned by Gov. John Penn to locate the line in 1775, fixed a mark on the Delaware River in lat. 42° N. for its starting point. The line was surveyed to Lake Erie in 1786 and 1787 pursuant to acts of the legislatures of both States and confirmed in 1789. The «Erie Triangle» formed part of the claims of both Massachusetts and New York in the Northwest Territory, which they ceded to the United States in 1781 and 1785, respectively. The triangle was thereupon purchased from Congress by Pennsylvania and the transaction was confirmed in a deed or warrant signed by President Washington in 1792. The Connecticut claim had for its basis Yankee cheek and the Connecticut charter of 1662, which purported to grant to the governor and company the territory bounded on the east by Narragansett Bay, on the north by Massachusetts and «with this breadth stretching westward to the South Sea,» that is, the Pacific Ocean. A settlement of boundaries had been arranged with the authorities of New York before 1683; but the intervention of a few thousand square miles of neutral territory was not enough, in the opinion of the calculating New Englanders, to prevent their territory taking up its march across the continent on the further side of New York. Certain citizens of Windham County, Conn., in 1753 petitioned the General Court to organize them as the Susquehanna Company and give them a quitclaim of 16 square miles of land on both sides of the Susquehanna River. The plan was approved and an inflow of settlers from Connecticut to the new country in the Wyoming Valley almost immediately began. The company was joined by the most prominent people in Connecticut; it bolstered up its title with purchases from the Indians, 10,000 square miles of which were laid out into shares, townships were surveyed and mills and cabins built. The War of Pontiac caused the suspension of operations for a time, but in 1769 when «Forty Fort» was built, five townships created, each five miles square, and each offered to 40 settlers who would defend the same, the proprietors of Pennsylvania took notice of the proceedings. They in turn leased lands to settlers who would agree to defend them and the manors of Stoke and Sunbury were established. Now began what is known as «the Pennamite and Yankee War.» The Pennsylvania garrison at Wilkesbarre was besieged by the Yankees. «Forty Fort» was stormed by the Pennamites. Alternately the latter were imprisoned in the New England forts and the New Englanders, taken by sheriffs' posses, locked up in Philadelphia. The Pennsylvania assembly refused to interfere because the disturbances did not affect the general government and the inhabitants of Wyoming continued to extend their settlement, passing laws, collecting taxes and even establishing a militia. The Connecticut legislature in 1773 resolved to support the colony. The proprietary, so stingy when the protection of settlers from Indian war parties was required, readily enough found means to defend is land titles. But when Governor Penn, in December 1775, sent an armed force of 500 men to dispossess the trespassers, and the latter had repulsed the invaders at Nanticoke with loss of life on both sides, the Continental Congress was moved to interfere. The combatants were directed to desist from hostilities until a legal determination of the dispute could be had. On petition of the supreme executive council of Pennsylvania, Congress, in 1782, nominated commissioners who decided that Connecticut had no claim to the territory. Connecticut acquiesced in 1800.

The New Commonwealth.—At the outbreak of the Revolution there was not anywhere in America a legislative body more democratic and more firmly opposed to the tyrannic exercise of royal prerogatives than was the Pennsylvania assembly. It promptly elected delegates to the Continental Congress, and voted money to aid Massachusetts in the conflict with the royal army. It went as far in resistance as Quaker scruples against war and violence would permit and had, rather reluctantly, consented to the appointment of a Committee of Safety (of which Franklin became president), empowered to call the people to arms. Government by Quaker meeting, however, would no longer serve. When Congress early in 1776 passed a resolution advising the colonies to organize governments fitted to meet present exigencies the Committe of Safety prescribed qualifications for electors, whereby all «enemies of liberty» were disfranchised and ordered a Constitutional Convention. The convention met on 15 July, declared the existing government unfit, adopted a «Bill of Rights and Constitution for the Commonwealth of Pennsylvania» and delivered the same to the assembly, which, uttering a feeble protest, adjourned on 16 September, never to meet again. The convention as a council of safety assumed the whole political power of the province. The Quakers as a body withdrew from public affairs. They were, rather unjustly, however, included with the Tories. They would not surrender their conscientious scruples against shedding blood, but they bore without complaint the heavy burdens imposed by the revolutionary council of safety on non-combatants and many of the younger men, undeterred by the fear of being «disowned» by the disciplinary meetings, joined the Revolutionary army. From 1776 to the end of the war Pennsylvania was Washington's base of operations; from hence he executed his raids into New Jersey and marched down to victory at Yorktown. Except during the occupation of the city by the British, under General Howe, from the fall of 1777 to the summer of 1778, the Continental Congress sat in Philadelphia. The Paoli massacre, the bivouac of the Continental army under Washington at Valley Forge and the reign of the mob following the withdrawal of General Howe, were the most stirring military and political events of the Revolution in Pennsylvania save one — the tragedy of Wyoming. The annihilation of the Connecticut settlement in 1778, while the able-bodied men were absent serving in the ranks of the Continental army, was the crowning infamy of British rule in America. The outrage was terribly avenged in 1779 when 3,000 men under General Sullivan marched into the country of the Six Nations, who with some English soldiers had committed the atrocity, and broke their power for mischief for all time. The constitution of 1776 created a legislature, the general assembly, consisting, like the provincial assembly, of a single chamber. The prejudices of the time against concentrated power were reflected in the institution of a plural executive, the supreme executive council. A council of censors to be elected once in seven years, and empowered to order impeachments, to rectify injustice in the levy of taxes and to direct the repeal of improper laws, was to act as a curb on possible legislative, executive and judicial tyranny. The general assembly thus tied could accomplish little. It secured from the proprietors in 1779, for a consideration of £130,000, a transfer of their property, exclusive of their manors and private estates, some of which belong to the Penn family to this day; in 1780 a law was passed giving freedom to all children born of slaves after that date; it procured the ratification by Pennsylvania of the Federal Constitution on 12 Dec. 1787, within three months after its submission to the States, and by this prompt action probably saved it from defeat. The frame of government of 1776, however, proved unworkable and on 2 Sept. 1790 a new State constitution, modeled on the recently adopted Constitution of the United States, was formally proclaimed. Thomas Mifflin, a «fighting Quaker» and a Democrat, became the first governor of the State. He was twice re-elected serving until December 1799. During his term occurred the «Whisky Rebellion» (q.v.) and the «Hot Water War.» The latter, a mere tumult in the German counties, was caused by a misunderstanding of the nature of the house tax ordered by Congress in 1798 and by the harangues of John Fries, an itinerant auctioneer with a stentorian voice and a gift of repartee, which nearly cost him his neck. The «traitor» was pardoned by Washington. The discovery of the utility of anthracite as fuel led to the canalization of the Lehigh River in 1818, and this and the improvement of the navigation of the Schuylkill in 1825, with a view to bringing the product of the lower coal fields to market, gave the impetus to the construction of State works on a scale which, for those times, was colossal. The ridge of the Alleghanies seemed to have been created for the purpose of thwarting the people, but they would not be balked. The rivers which could not be made navigable were to be paralleled by canals and were to be connected one with the other so that continuous water communication should be established between eastern Pennsylvania, central New York and the Mississippi Valley. The main lines to the West was to run by way of the Juniata, the Conemaugh and a portage railway, whereby boats were to be lifted over the intervening mountain. Before 1829 the State owned 450 miles of canals and had expended $6,000,000 in construction. The works undoubtedly had a beneficent effect; they increased traffic and thus promoted the public welfare. But they exercised a corrupting influence in politics and nearly bankrupted the State. By 1840 the Commonwealth owned 726 miles of railways and canals, which had cost $26,500,000, and 200 miles were under construction; the entire income from them was required or had been pledged to pay interest on the debt incurred, and State stocks had become «an unsalable drug in the market.» The State had been made the victim of gross frauds by contractors; the principle of short tenures and rotation in office applied to surveyors, engineers, etc., was not conducive to efficient and economical management; the most profitable branch of the business, the carriage of passengers, was farmed out to private corporations especially created for that purpose by pliant legislators. The total receipts from the public works from 1830 to 1859 amounted to $32,270,712.55; the expenditures were $30,400,433.07. The debt of the State, before rock bottom was reached, amounted to nearly $41,000,000. The works were finally sold, the main line to the Pennsylvania Railroad in 1856, nearly all the rest in 1857 — the State realizing about $11,000,000 from the sale. The deliberate verdict of the people on State ownership was expressed in the Constitutional Amendment of 1857, forbidding partnerships between the Commonwealth and transportation, banking and other companies, and limiting the borrowing powers of the legislature to $750,000. Down to 1860 Pennsylvania was normally a Democratic State, though by a small majority; and the Whigs occasionally controlled the government — sometimes through coalitions, as with the Anti-Masons in 1835 and the «Know-Nothings,» in 1854. «As goes Pennsylvania so goes the Union,» had been a maxim in American politics for two generations, and when Andrew J. Curtin, the first Republican governor, was elected in October 1860 by a majority of 30,000, the supporters of Lincoln were justified in their hope, to be realized a month later, that they would carry the country. Six days after the bombardment of Fort Sumpter, two regiments of Pennsylvania troops marched into Washington — the first to arrive in defense of the national capital. The first call for volunteers in the Civil War was responded to by nearly twice the 75,000 required, and Governor Curtin was enabled to organize a reserve of 11 regiments besides the 14 which constituted the quota of the State. Altogether Pennsylvania contributed 362,284 men to the Union armies, exclusive of militia. The State was trice invaded; the invasions of 1862 and 1864 were mere raids, but it was «the high tide of the Confederacy» which rolled into Cumberland Valley in July 1863 and was forced back at Gettysburg. Among the generals who commanded in that three days' battle Geary, Hancock, Meade and Reynolds were natives of the State.

Since the Civil War the history of the Commonwealth has been mainly the history of its industries and commerce. A new constitution was adopted in 1873, which effected many important changes, chiefly in the restriction of the powers of the legislature and of common carriers. The abuses which had grown out of special legislation and the passage of «omnibus» bills were enjoined with searching minuteness; municipal and other corporations were thereafter to be organized only under general laws, and a whole article, containing 33 sections and many sub-sections, was devoted to an enumeration of the things which the general assembly should not be permitted to do. Railroads and canal companies were forbidden to make any «undue or unreasonable» discrimination in rates or in the furnishing of cars or motive power; to own, lease or control competing and parallel lines or to engage in manufacturing, mining or other business except that of transportation — the convention anticipated the Interstate Commerce Law by more than 10 years. The financial panic of 1873 and the succeeding years of industrial stagnation were attended, as are all crises in human history, by serious social disturbance. The story of the reign of terror instituted in the anthracite regions by the «Molly Maguires» (q.v.) in 1873 pertains to the history of crime rather than of industry, and the «Mollies» were a sprout from foreign soil. The railway riots of July 1877, which centred in Pittsburgh, cannot be dismissed, however, as having been manifestations of imported lawlessness. The local authorities displayed lamentable weakness in permitting the mob to grow to dangerous dimensions; they were guilty of something worse than negligence if the testimony that the militia were fired on from a police station be credible. In 1892 again forcible methods to prevent a reduction of wages plunged a part of the Commonwealth into a state bordering on civil war when the military and the striking steel workers confronted one another at Homestead. But contempt for the law may be shown in other manner than by the commission of crimes of violence. The secret traffic agreement, which was a most potent factor in the upbuilding of the oil monopoly, was in direct conflict with the constitutional provision against unfair preferences by carriers; the combination of the anthracite mining and carrying companies circumvents, if it does not violate, the letter and spirit of the constitution of 1873. The great strike of the anthracite miners in 1902 disclosed the progressive perfection attained in the organization of the labor unions. The consent of the parties to arbitration, though reluctantly given, was an acknowledgment of the superior rights of the general community, which monopolistic combinations, whether of laborers or capitalists, must be made to respect. One outcome of the

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List of Governors or Executives of the Dutch and Swedish Colonies on the Delaware and of the Province and Commonwealth of Pennsylvania.

COLONIAL GOVERNMENTS.

Peter Minuit, Governor of New Sweden	1638–1641
Peter Hollender, Governor of New Sweden	1641–1643
John Printz, Governor of New Sweden	1643–1653
John Pappegoya, Governor of New Sweden	1653–1654
John Claude Rysinghe, Governor of New Sweden	1654–1655
Peter Stuyvesant, Governor of New Netherlands	1655–1664
Col. Richard Nicholls, Governor of New York	1664–1667
Col. Francis Lovelace, Governor of New York	1667–1673
Anthony Colve, Governor of New Netherlands	1673–1674
Sir Edmund Andross, Governor of New York	1674–1681

PROVINCIAL GOVERNMENT.

William Penn, Proprietor	1681–1718
William Markham, Deputy Governor	June 1681–June 1682
William Penn, Governor in person	Oct. 1682–June 1684
Thomas Lloyd, President of the Council	Aug. 1684–Dec. 1686
Capt. John Blackwell, Deputy Governor	Dec. 1686–Jan. 1690
Thomas Lloyd, President of the Council	Jan. 1690–Mar. 1691
Thomas Lloyd, Deputy Governor for Province	Mar. 1691–April 1693
William Markham, Deputy Governor for Lower Counties	
William Markham, Deputy Governor under the Crown	April 1693–Mar. 1695
William Markham, Deputy Governor under the Proprietor	Mar. 1695–Dec. 1699
William Penn, Proprietor and Governor	Dec. 1699–Nov. 1701
Andrew Hamilton, Lieutenant-Governor	Nov. 1701–April 1703
Edward Shippen, President of the Council	April 1703–Feb. 1704
John Evans, Lieutenant-Governor	Feb. 1704–Feb. 1709
Charles Gookin, Lieutenant-Governor	Feb. 1709–July 1717
Sir William Keith, Lieutenant-Governor	May 1717–July 1718
John, Richard and Thomas Penn, Proprietors	1718–1746
Sir William Keith, Lieutenant-Governor	July 1718–July 1726
Patrick Gordon, Lieutenant-Governor	July 1726–Aug. 1736
James Logan, President of the Council	Aug. 1736–Aug. 1738
George Thomas, Lieutenant-Governor	Aug. 1738–May 1746
Thomas Penn and John, son of Richard, Proprietors	1746–1776
George Thomas, Lieutenant-Governor	May 1746–May 1747
Anthony Palmer, President of the Council	May 1746–Nov. 1748
James Hamilton, Lieutenant-Governor	Nov. 1748–Oct. 1754
Robert Hunter Morris, Lieutenant-Governor	Oct. 1754–Aug. 1756
William Denny, Lieutenant-Governor	Aug. 1756–Oct. 1759
James Hamilton, Lieutenant-Governor	Oct. 1759–Nov. 1763
John Penn, Lieutenant-Governor	Nov. 1763–April 1771
James Hamilton, President of the Council	April 1771–Oct. 1771
Richard Penn (brother of John), Lieutenant-Governor	Oct. 1771–Aug. 1773
John Penn, Lieutenant-Governor	Aug. 1773–July 1776

GOVERNMENT OF THE COMMONWEALTH.

Benjamin Franklin, Chairman Committee of Safety		17 Sept. 1776–4 Mar. 1777
Thomas Wharton, Jr., President Executive Council		5 Mar. 1778–23 May 1778
George Bryan, acting, vice Wharton, deceased		23 May 1778–1 Dec. 1778
Joseph Reed, President Executive Council		1 Dec. 1778–8 Oct. 1781
William Moore, President Executive Council		14 Nov. 1781–8 Oct. 1782
John Dickinson, President Executive Council		7 Nov. 1782–18 Oct. 1785
Benjamin Franklin, President Executive Council		18 Oct. 1785–14 Oct. 1788
Thomas Mifflin, President Executive Council		5 Nov. 1788–20 Dec. 1790
Thomas Mifflin, Governor		21 Dec. 1790–17 Dec. 1799
Thomas McKean, Governor	Democrat	17 Dec. 1799–20 Dec. 1808
Simon Snyder, Governor	Democrat	20 Dec. 1808–16 Dec. 1817
William Findlay, Governor	Democrat	16 Dec. 1817–19 Dec. 1820
Joseph Hiester, Governor	Independent Democrat	19 Dec. 1820–16 Dec. 1823
John Andrew Shulze, Governor	Democrat	16 Dec. 1823–15 Dec. 1829
George Wolfe, Governor	Democrat	15 Dec. 1829–15 Dec. 1835
Joseph Ritner, Governor	Anti-masonic	15 Dec. 1835–15 Jan. 1839
David Rittenhouse Porter, Governor	Democrat	15 Jan. 1839–21 Jan. 1845
Francis Rawn Shunk, Governor	Democrat	21 Jan. 1845–9 July 1848
William Freame Johnston, Governor	Whig	26 July 1848–20 Jan. 1852
William Bigler, Governor	Democrat	20 Jan. 1852–16 Jan. 1855
James Pollock, Governor	Democrat	16 Jan. 1855–19 Jan. 1858
William Fisher Packer, Governor	Democrat	19 Jan. 1858–15 Jan. 1861
Andrew Gregg Curtin, Governor	Republican	15 Jan. 1861–15 Jan. 1867
John White Geary, Governor	Republican	15 Jan. 1867–21 Jan. 1873
John Frederick Hartranft, Governor	Republican	21 Jan. 1873–21 Jan. 1879
Henry Martyn Hoyt, Governor	Republican	21 Jan. 1879–16 Jan. 1883
Robert Emory Pattison, Governor	Democrat	16 Jan. 1883–18 Jan. 1887
James Addams Beaver, Governor	Republican	18 Jan. 1887–20 Jan. 1891
Robert Emory Pattison, Governor	Democrat	20 Jan. 1891–15 Jan. 1895
Daniel H. Hastings, Governor	Republican	15 Jan. 1895–17 Jan. 1899
William A. Stone, Governor	Republican	17 Jan. 1899–15 Jan. 1903
Samuel W. Pennypacker, Governor	Republican	20 Jan. 1903–15 Jan. 1907
Edwin S. Stewart, Governor	Republican	15 Jan. 1907–17 Jan. 1911
John K. Tener, Governor	Republican	17 Jan. 1911–19 Jan. 1915
Martin G. Brumbaugh, Governor	Republican	19 Jan. 1915–

arbitration was the judicial recognition of the principle of collective bargaining. Since 1860 Pennsylvania has been overwhelmingly Republican. The late Governor Pennypacker became official authority for the statement that the Commonwealth "has no ills worth mentioning." There were political evils, plenty of them, in the good old times, and such as exist are, perhaps, no greater and no more incurable than those which have been grappled with and remedied in other days. While not marching in the forefront, Pennsylvania's legislators have kept step with those of the more progressive sister States. A public service commission with adequate powers has been created. Child and woman labor laws according to the best models have been passed and a system of workingman's compensation and State insurance against the accidents of industry has been established, which has many points of excellence. The election laws have been radically reformed, but the ballot law remains one of the worst in the country. The long continuance in power of one party, whose managers feel secure against effective criticism through their command over majorities counted by the hundred thousand, is no doubt an evil in itself. Under such conditions a really healthy political life is impossible. Broadly speaking, the community has advanced steadily, ethically as well as materially; the course of human progress has eddies and cross-currents here as elsewhere. Experience, as Franklin remarked, keeps a dear school, but the lessons of this hard task-mistress, once they have been thoroughly mastered, are as likely to be heeded in the future as they have been in the past.

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STEPHEN PFEIL,
Formerly Editor of the Philadelphia Press.

PENNSYLVANIA, University of, located at Philadelphia. In 1749 Benjamin Franklin published a pamphlet entitled 'Proposals Relating to the Education of Youth in Pennsylvania,' and shortly afterward 24 citizens of Philadelphia associated themselves for the establishing of an "academy." They joined with the new institution a charitable school which had been in existence since 1741 and the building occupied by this school became the home of the two schools so combined. The academy classes were first opened in 1751 and the free charitable part of the institution was maintained until well into the 18th century, when the charitable feature was merged into free scholarships in the college. In 1753 the treasurer obtained a charter from the proprietors of the colony of Pennsylvania in which the institution was designated as a "college and academy." In 1761 the college was in need of funds, and Dr. Smith, the provost, was sent to England to raise money for an endowment. There he met the commissioner from King's College (now Columbia) who had come on a similar errand, and they agreed to aid each other; through the influence of the archbishop of Canterbury, they obtained a circular letter from the king to all the churches, and succeeded in raising a considerable amount of money for each college. During the Revolution the college did not prosper; the attention of students was diverted by the stirring events of the time and the city was for a time occupied by British troops; hence the college was closed for over a year and a half and the buildings used for other purposes, being the meeting place of the Congress for several days in July 1778. In 1779 the legislature, on a pretext that the original plan of the college was not being carried out, seized its rights and properties and transferred them to a new organization, called the "Trustees of the University of the State of Pennsylvania"; in 1789 the property was restored, and in 1791 the old college and the university united under the corporate name of the University of Pennsylvania. For several years (1802–29) the university occupied the house which was built for the residence of the President of the United States, when it was expected that Philadelphia would become the national capital; and later new buildings were erected on the same site. In 1872 the university was moved to its present site in West Philadelphia and the original group of four buildings erected. The most marked growth has taken place since that time; the work of the old departments extended and many new buildings added.

The first professional department established was that of medicine, founded in 1765, being the first medical school in the United States. Lectures in law were given in the university as early as 1790, but the law department did not receive its present organization till 1850. The university was among the earliest to undertake systematic instruction in science, technology and engineering. In 1852 it was resolved to establish a department of mines, arts and manufactures, and professorships in geology and mineralogy, civil engineering and mining; also two regular courses in science were offered. In 1874 John Henry Towne, a trustee, made the university the residuary legatee of his estate; whatever sum might accrue from this bequest to form a portion of the endowment fund of the university, and the income from it to be devoted exclusively to the payment of the salaries of professors and instructors in the department of science. In recognition of this gift the department was named the «Towne Scientific School of the University of Pennsylvania.» The present organization of the university includes: the College, the Graduate School, the Law School, the School of Medicine, the University Hospital, the Wistar Institute of Anatomy and Biology, the Laboratory of Hygiene, the School of Dentistry, the School of Veterinary Medicine, the Veterinary Hospital, the University Library, the University Museum, the Flower Astronomical Observatory, the Department of Physical Education, the Wharton School, the Towne Scientific School, the School of Education, the Henry Phipps Institute, the Graduate School of Medicine, the Evans Institute. The School of Arts confers the degree of A.B. Electives were first introduced to a slight extent in 1867; and the number of elective studies for the junior and senior years were increased in 1887. In 1893 the group system was established, by which privilege of election in certain subjects was carried into the first two years.

The Wharton School of Finance and Commerce is intended to give special training to students who expect to enter banking, insurance, railway service, manufacturing, law and public service, social work or accounting. Graduate courses are also offered to advanced students in the same general fields. The object of the Wistar Institute of Anatomy and Biology is to afford facilities to post-graduates and advanced students; it is a distinctive corporation with separate funds, but organically united with the university so as to constitute one of its departments. The library is one of the original departments of the university, and contains many interesting historical documents; it includes several special libraries, and contained (1919) nearly 500,000 volumes. The University Museum (organized 1889) was made a department of the university in 1891; in 1902 E. W. and C. H. Clark founded, in this department, the Clark Research Chair of Assyriology. Women are admitted to a number of the courses. The present site of the university is on rising ground, half a mile west of the Schuylkill River; the buildings number 33; among them are Houston Hall, the centre of the student social life, College Hall, the library, the University Museum and the gymnasium. Among the notable new buildings are the laboratories for engineering and medicine, which together have cost $1,500,000. Much attention is paid to systematic physical culture and to general athletics. There is an athletic field (Franklin field) which is equipped with a gymnasium and a stadium which accommodates nearly 25,000 persons. The final control of athletic sports is vested in the Council on Athletics.

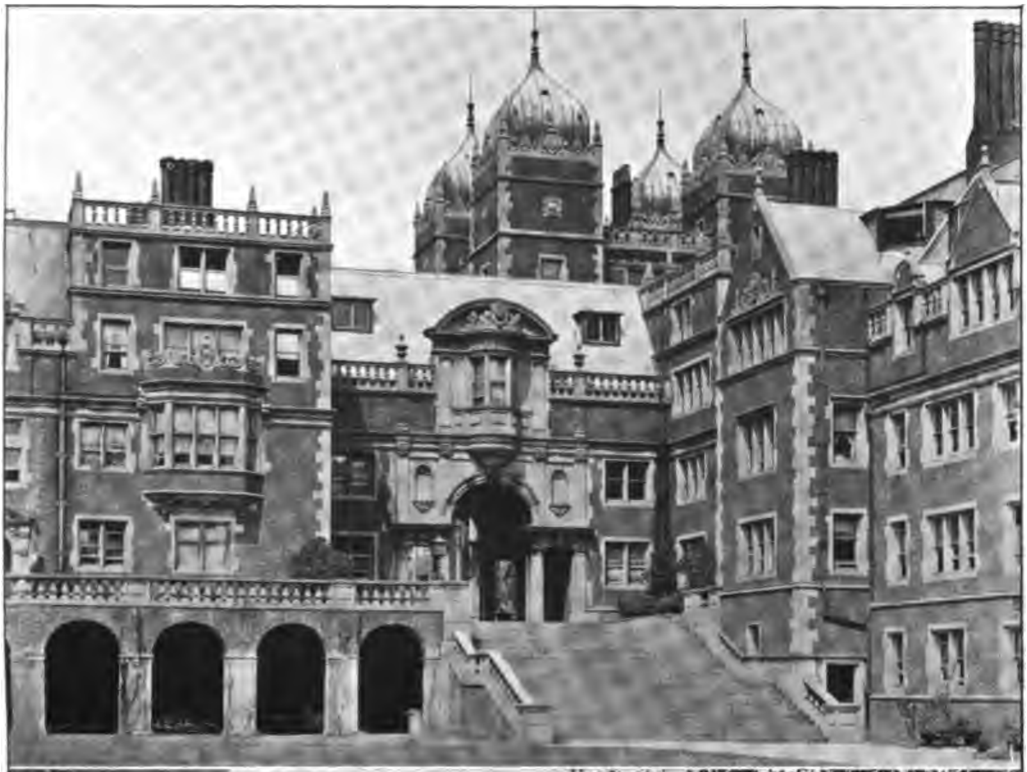
The students have a number of large debating societies, dramatic societies and musical clubs. The Greek letter fraternities are well established, 43 having chapters, many of which have attractive fraternity houses. Consult Lippincott, H. M., 'The University of Pennsylvania' (1919).

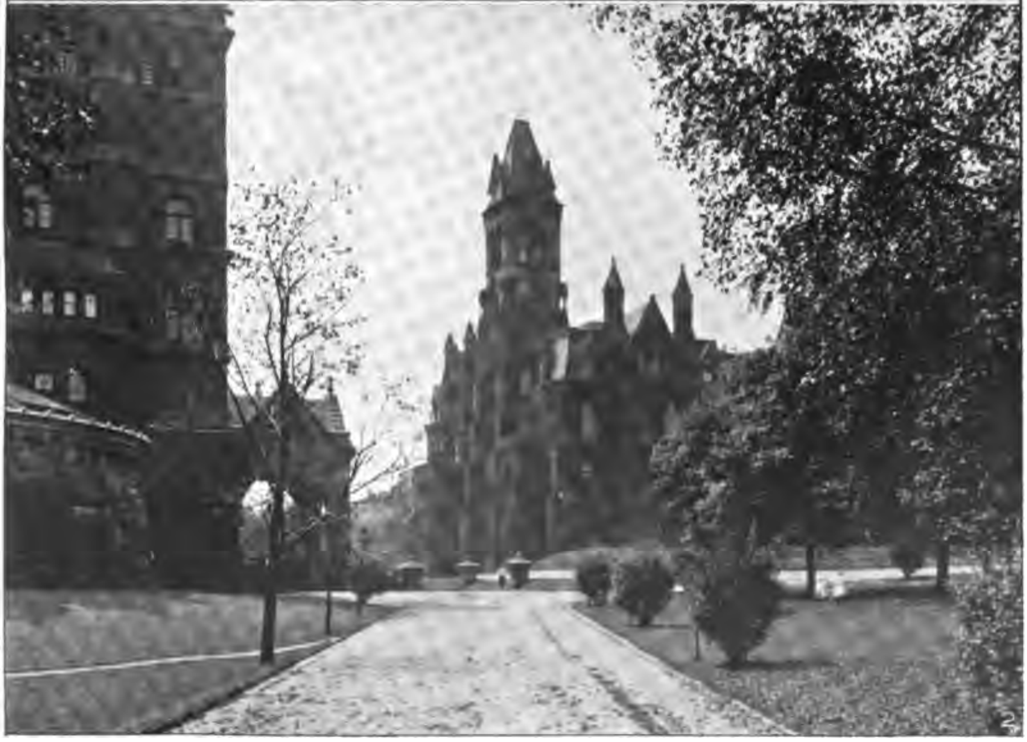
PENNSYLVANIA, Western University of. See WESTERN UNIVERSITY OF PENNSYLVANIA.

PENNSYLVANIA COLLEGE, a nonsectarian institution of learning at Pittsburgh, Pa., founded in 1870. Its faculty numbers 19; the average annual enrolment of students is 185; tuition fees are $120; living expenses, board, etc., $250 to $350; the productive funds amount to $420,000; total income, including tuition and incidental charges, $83,840. The college colors are orange-blue. The library contains over 5,000 volumes. The graduates since enrolment number 1,242.

PENNSYLVANIA COLLEGE OF GETTYSBURG, located at Gettysburg, Pa. It was chartered in 1832 under the auspices of the Lutheran Synod of Pennsylvania. In 1850 the charter was modified to incorporate Franklin and Marshall College, and the Franklin professorship was endowed by the funds thus obtained. When in 1863 Pennsylvania was threatened with invasion a company formed mainly of students of the college was the first to respond to the call for volunteers and became Company A of the 26th Emergency Regiment. Though this took away the majority of the students the college remained in session until the day of the battle of Gettysburg. The college buildings were used for hospital purposes, and it is estimated that they sheltered at least 500 wounded Confederates. The college offers two regular courses, classical and scientific, leading respectively to the degrees of A.B. and B.S.; and provision is made for special work for those who are not candidates for a degree, and for graduate work leading to the degrees of A.M., M.S. and Ph.D. There is also a preparatory department. The work of the junior and senior years is partially elective. In 1888 all departments of the college were opened to women, the preparatory department being already open to them; there is no women's dormitory, however, and the number entering is small. The buildings include (1916) four dormitories, recitation hall (containing the library), the chapel, the chemical laboratory, the astronomical observatory, the gymnasium and the academy. The library contains over 37,500 volumes, including the regular college library and the libraries of the two literary societies. In 1916 the annual income was $60,000; the students numbered 447, and the faculty 28. The courses of study are arranged in 10 groups as follows: Greek and Latin; Latin and Modern Languages; History and Political Science; Chemistry and Physics; Biology, Chemistry and Physics; Commerce and Finance; Civil Engineering; Municipal Engineering; Mechanical Engineering; and Electrical Engineering. The first three courses lead

UNIVERSITY OF PENNSYLVANIA





1 Dormitory Terrace

2 Campus — Library and College Hall Tower

to the degree of A.B. while the last seven lead to the degree of B.S.

PENNSYLVANIA COLLEGE FOR WOMEN, located at Pittsburgh, Pa. It was founded in 1869 under the auspices of the Presbyterian Church. The collegiate department offers a classical and a literary course and confers the degree of A.B. Instruction is given in music and art, and there is also a preparatory department. A department of social service gives special training in that sphere of effort, and practical work in the field is arranged for in connection with the widely diversified philanthropies and charities of the city of Pittsburgh. In 1918 the grounds and buildings were valued at over $180,000; the annual income was $55,000. The library contained 5,000 volumes; the students numbered 185 and the faculty 19.

PENNSYLVANIA DUTCH, a dialect, partly English and partly German (often corrupt), spoken by the descendants of the original German settlers of parts of Pennsylvania.

PENNSYLVANIA-GERMAN SOCIETY, a patriotic-historical association organized 15 April 1891, at Lancaster, Pa., to collect, preserve and publish letters, papers and documents relating to the biography, genealogy, history and folklore of the Pennsylvania-Germans in America, and to gather into a permanent library all books pertaining thereto. The members must be direct descendants of early German or Swiss emigrants to the colony of Pennsylvania. There are about 400 members, embraced in three classes: regular, associate and honorary. Meetings are held annually. The Society has published 25 volumes of their proceedings, together with much historical material, and of late years has reprinted many of its earlier volumes.

PENNSYLVANIA HISTORICAL SOCIETY, organized in Philadelphia, 2 Dec. 1824, and incorporated 2 June 1826, is famous for its valuable collection of material, historical and genealogical, relating to the State, its founders and prominent families. Notable are the records and papers of the Penn family, the Charlemagne Tower collection of American colonial laws, first editions of Bradford, Franklin and Christopher Saur books, early American printed handbills, pamphlets, portraits and relics. The subscribed publication fund of the society amounts to $40,000. Since 1877 the *Pennsylvania Magazine of History and Biography* has been issued quarterly and now comprises over 40 volumes; besides 14 volumes of *Memoirs of the Society;* one of *Bulletins;* one of *Collections;* one on ‘Pennsylvania and the Federal Constitution’ and an historical map of the State. In the library are over 5,000 volumes of manuscripts, about 260,000 special pamphlets and over 152,000 bound books.

PENNSYLVANIA RAILROAD COMPANY, The. The incorporate name of one of the great transportation systems of the United States. It controls and operates the network of railroads east of Pittsburgh and having its centre in the State of Pennsylvania. A second corporation organized in 1871, with a present capitalization of $80,000,000, is called the Pennsylvania Company and controls and operates the railroads of the system west of Pittsburgh. The railway, ferry, canal and other transportation lines, owned, operated or controlled by, or affiliated in 1915 with, the Pennsylvania Railroad system have an aggregate mileage as follows: East of Pittsburgh, 6,519.02 miles; west of Pittsburgh, 5,303.99; making a total of 11,823.01 miles. The company owns and operates directly, east of Pittsburgh, a total mileage of 4,541.04, in five divisions, as follows:

Eastern Pennsylvania Division	1,339.55 miles
Western Pennsylvania Division	741.69 miles
New Jersey Division	541.08 miles
Central Division	1,112.62 miles
Northern Division	806.10 miles
Total	4,541.04 miles

The first-named division is composed of the original parent lines of railroad, several of which had their beginning in the early half of the 19th century. On 7 April 1826, the Pennsylvania legislature granted a charter to the Columbia, Lancaster and Philadelphia Railroad Company. In 1832 among other roads incorporated were the Harrisburg, Portsmouth, Mount Joy and Lancaster and the Philadelphia and Trenton. In 1833 the Columbia Railroad was built.

Early History.— On 13 April 1846 an act to incorporate the Pennsylvania Railroad Company was passed by the State legislature. The capital of the company was fixed at $7,500,000. The company was authorized to build a road to connect with the Harrisburg, Portsmouth, Mount Joy and Lancaster Railroad, and to construct a line to Pittsburgh or any other place in the county of Allegheny, or to the town of Erie. On 25 Feb. 1847 Governor Shunk granted a charter to the company. The grading of the first 20 miles of road west of Harrisburg was under contract 16 July 1847 and 40 miles additional on 26 November. On 1 Sept. 1849 the first division, extending from Harrisburg to Lewistown, a distance of 61 miles, was opened to travel On 15 Feb. 1854 cars run through from Philadelphia to Pittsburgh. On 31 July 1857 (pursuant to provisions of an act of the Commonwealth of Pennsylvania of 16 May 1857) the Commonwealth of Pennsylvania sold and conveyed to The Pennsylvania Railroad Company, inter alia, a line of railroad and facilities between Philadelphia and Columbia, Pa., known as the Philadelphia and Columbia Railroad, with power to operate and extend the same. In 1861 the Harrisburg, Portsmouth, Mount Joy and Lancaster Railroad was leased by the Pennsylvania Company for 999 years, which gave the corporation the ownership of the through line from Philadelphia to Pittsburgh.

Civil War Period.— J. Edgar Thomson, the chief engineer of the company, under whose direction the road was built, was elected president of the company 2 Feb. 1852. In 1858 Col. Thos. A. Scott was appointed general superintendent of the road; he became vice-president in March 1860. It was Colonel Scott who, at the outbreak of the Civil War, was appointed to take charge of government railroads and telegraphs. He was instructed by Simon Cameron, Secretary of War, after the destruction of the Northern Central Railway, to open a line of communication from Washington to Philadelphia and the North and East. The

Pennsylvania Railroad Company at once placed all its resources at the disposal of Colonel Scott, and a route via Annapolis and Perryville was placed at the disposal of the government in a few months.

In 1862 the Philadelphia and Erie Railroad passed to the control of the Pennsylvania Company under a lease for 999 years. Meanwhile the road had improved its main lines and branches, and in 1864 began the use of steel rails and the development of their manufacture.

Western Lines.— The next important undertaking was to aid the construction of lines west of Pittsburgh. The Pittsburgh, Fort Wayne and Chicago Railroad was the first of these to be built, work on which commenced 4 July 1849, extending 468 miles from Pittsburgh to Chicago, and being the essential link in the chain which was to bind the Atlantic Seaboard and the Mississippi Valley. On 7 June 1869 this road was leased by the Pennsylvania Railroad Company for 999 years; as was also Newcastle and Beaver Valley Railroad, the Massillon and Cleveland Railroad, the Akron Branch Railroad and the Lawrence Railroad, all in Ohio. On 6 Nov. 1867 the Pittsburgh and Steubenville Railroad was sold at auction and was purchased by the Pennsylvania. In 1869 the leases were signed for the control of the Pittsburgh, Cincinnati and Saint Louis Railroad and its numerous branches. In 1869 the Cincinnati and Muskingum Valley and the Saint Louis, Vandalia and Terre Haute, and the Terre Haute and Indianapolis roads were added, thus extending the line to the Mississippi River at Saint Louis. In March 1870 the Erie and Pittsburgh was leased and in October 1871 the Cleveland and Pittsburgh was also leased for 999 years. In the same year the Pennsylvania purchased a controlling interest in the Jeffersonville, Madison and Indianapolis, extending from Indianapolis, Ind., to Louisville, Ky. Other roads, large and small, were added to the system from time to time, embracing important direct and connecting lines in Ohio, Indiana, Illinois, Michigan, Kentucky, West Virginia, Missouri and other States.

Eastern Development.—After the Civil War the Pennsylvania made rapid progress east of Pittsburgh. Between 1868 and 1872 the company leased the Philadelphia and Trenton Railroad; Camden and Amboy Railroad and the United New Jersey Railroad and Canal Company; and in 1873 completed the Baltimore and Potomac Railroad, and built the Baltimore Tunnel. Further acquisitions of connecting lines have since been made from time to time, including the Allegheny Valley Railway, the Western New York and Pennsylvania Railway, Cambria and Clearfield Railway and the Northern Central Railway. Numerous branch lines were built in the mining and lumber districts, the principal of which was the Schuylkill Valley Railroad, from Philadelphia to Pottsville, Pa., and Wilkesbarre, which brought the anthracite coal region in touch with the main line. The company has a four-tracked line from New York to Pittsburgh, a double-tracked line from Pittsburgh to Chicago. A tunnel under the Hudson River, with a terminal in New York City, and an extension to Long Island, opened 8 Sept. 1910, is one of the more recent improvements instituted by this company, affording great transportation facilities to all points mentioned. The tunneling of the two rivers and Manhattan Island was the most notable piece of underground engineering ever undertaken. See NEW YORK CITY.

The company has water lines on Chesapeake Bay and Long Island Sound, covering a distance of 2,000 miles of water transportation.

Finances.— The general income account of the Pennsylvania Railroad for the year ending 31 Dec. 1915 shows total operating revenues of $196,628,170.10; total operating expenses, $142,736,560.83; net operating revenue, $53,891,609.27. The operating revenues are from lines directly operated and include freight, passenger, mail, express, other transportation and incidental maintenance of equipment, traffic, transportation, general and miscellaneous. After deducting taxes and uncollectible railway revenues, the railway operating income was $46,250,924.68. Income from securities and other sources brings this up to $66,626,245.34; deducting fixed charges from this leaves a net income of $42,425,322.32.

Traffic Statistics.— The traffic statistics for all lines owned, operated or controlled by, or affiliated in interest with, the Pennsylvania Railroad system, both east and west of Pittsburgh, for 1915 were as follows:

PASSENGER

	Number of passengers	
	1915	Comparison with 1914, decrease
Lines east of Pittsburgh and Erie.	140,879,300	9,073,329
Lines west of Pittsburgh and Erie.	31,111,793	2,090,871
Total	171,991,093	11,164,200

FREIGHT

	Number of tons	
	1915	Comparison with 1914, increase
Lines east of Pittsburgh and Erie.	182,187,383	8,553,398
Lines west of Pittsburgh and Erie.	157,740,337	17,256,957
Total	339,927,720	25,810,355

Equipment.— The following figures show the equipment available for service on lines of the Pennsylvania system east and west in 1910:

Locomotives of all kinds	7,373
Passenger, express and mail cars	6,706
Freight cars	276,619
Maintenance of way, car equipment	4,536
Floating equipment, ferry boats, tugs, barges, etc	448
Total	295,682

The number of employees 31 Dec. 1910 in the service east of Pittsburgh was about 150,000; west of Pittsburgh about 60,000; making a total of 210,000. Applying the statistics of the last census that there is an average of five persons dependent upon the head of each family, it would seem that there are more than a million of people who depend directly upon the operations of the road for their means of subsistence. In addition, there are the employees of many industries supplying rails, cars, locomotives, etc., besides merchants of all classes in the cities and towns located along the roadway, whose prosperity is largely dependent thereon. The company asks and insists upon faithful service from

PENNSYLVANIA STATE COLLEGE

its employees. It administers a fund which takes care of them in cases of sickness or accident, and when their days of usefulness are over it provides them with a pension which cares for them in their declining years. The company also maintains an Employees Saving Fund, so that employees may leave on deposit with the company such portion of their wages as they may desire, upon which a stipulated rate of interest is allowed.

PENNSYLVANIA STATE COLLEGE, The, located at State College, Pa., is one of the chain of «land-grant» colleges established in 1863 by the State and Federal governments under the Act of 1862. It was first chartered in 1855 as a Farmer's High School and in 1861 it graduated a class of 11, probably the first graduates in a purely agricultural course in the United States. It is beautifully situated on a plateau of the eastern slope of the Alleghany Mountains, 1,200 feet above sea-level. The total valuation of property under college control is $3,306,422.66. About 1,400 acres of land are used for campus, farm and experimental purposes. The buildings number 35, harmonizing in location, architecture and building materials according to the school groups. There are six schools — Agriculture, Engineering, Home Economics, Liberal Arts, Mining and Natural Science — offering a total of 42 four-year courses of study. Courses in the Liberal Arts lead to the bachelor of arts and in other schools to the bachelor of science. Engineering and master's degrees are conferred on graduates after one year of study. The doctorate degree is not given. Short courses are offered in agriculture, industrial engineering, milling engineering and home economics. A summer session in which only teachers of Pennsylvania are permitted to register is a novel feature. A winter course of one week during the holidays for farmers and home-makers attracts over 1,000 students annually.

The experimental work of the college is conducted in an agricultural, an engineering and a mining experiment station, under Federal and State appropriations. The agricultural extension division maintains county agricultural agents in nearly every county of the State, offers correspondence courses, organizes boys' and girls' clubs, holds institutes and sends experts to help solve farming problems. The engineering extension division organizes and conducts apprentice schools in manufacturing plants and industrial centres. The liberal arts extension supplies lecturers, topics and material for clubs, and organizes public school debating leagues. Military drill and gymnasium practice are required of all students during the first two years in college, under instruction of officers detailed from the United States army. All forms of college sports are fostered; 40 acres of the campus are set aside for play- and drill-grounds. The trustees number 31, being divided into four classes: Ex-officio State officials; appointed by the governor; chosen by the alumni; and elected by delegates representing the learned societies of the State.

The following statistics are given for the college year ending 31 June 1916: Total instructors, 255; experimental and extension staff, 84. Total enrolment of college men, 2,388; women, 147; summer session, 1,024; grand total, 2,535. Total in engineering apprentice schools, 3,516; in correspondence courses, 4,510. Number of volumes in library, 58,200. Total income of college from United States, $126,893; from State appropriation, $472,245; from other sources, $232,152; total budget. $831,290.

PENNSYLVANIAN SERIES, *in geology,* one of the three principal subdivisions of Carboniferous time having the Permian above and Mississippian below. It occupies extensive areas in many parts of the United States, including the great coal measures of Pennsylvania, and the Central-Eastern and Southeastern States as far west as eastern Nebraska and Oklahoma. Farther west it consists mainly of limestone deposited in moderately deep water, a condition unfavorable for coal accumulation. Some geologists class the Pennsylvanian as uppermost Carboniferous, others regard it as a separate system or period.

PENNY, a British coin and money of account, in value the 12th part of a shilling. It was at first a silver coin weighing about 22½ grains troy, or the 240th part of a Saxon pound. Till the time of Edward I the penny was so deeply indented by a cross mark that it could be broken into halves (thence called half-pennies) or quarters (four-things or farthings). A «gold penny» was coined in 1257 during the reign of Henry III. It had the value of 20 silver pennies of that time. Edward I in 1300 reduced the weight of the penny to a standard, ordering that it should weigh the 20th part of an ounce, that is, 22 grains. Edward III reduced its weight three times, leaving it at 18 grains. Edward IV reduced it in 1464 to 12 grains and Henry VIII, in 1527, to 10½ grains. It was still further reduced to 8 grains under Edward VI in 1552, and at last, in the reign of Elizabeth, it was fixed at $7\frac{23}{31}$ grains, or the 62d part of an ounce of silver. This proportion was observed up till the introduction of the bronze coinage in 1860. George III coined a copper penny in 1797. It weighed one ounce and did not come into favor because of its clumsiness. The intrinsic value of the bronze penny is about half of that of the old copper coin. The bronze of which the present British penny is coined is composed of copper, 95 per cent; tin, 4 per cent; and zinc, 1 per cent. Copper pennies were coined by the American colonies prior to 1780. See NUMISMATICS.

PENNYPACKER, Samuel Whitaker, American jurist and author: b. Phœnixville, Pa., 9 April 1843; d. Schwencksville, Pa., 2 Sept. 1917. He received his education at the Grovemont Seminary at Phœnixville and at the West Philadelphia Institute. As a member of the 26th Emergency Pennsylvania regiment he participated in the first engagement at Gettysburg (1863). He then studied law at the University of Pennsylvania and after admission to the bar was elected in 1868 president of the Law Academy of Philadelphia. His legal productions include four volumes of 'Supreme Court Reports,' a volume of 'Colonial Cases,' a 'Digest of the English Common Law Reports' and he also assisted in the publication of 45 volumes of the 'Weekly Notes ot Cases.' In 1889 he was appointed judge of the Court of Common Pleas No. 2 and was elected for two terms of 10 years each, acting for five years as president judge of that court. In 1902 he became governor of Pennsylvania and in that capacity instituted several notable reforms. During his administration a law was passed requiring newspapers to print the names of their owners and editors and making them responsible for negligence; the State constabulary, the health department and the highway department were created and a new capitol building was erected. Governor Pennypacker's session was particularly stormy. He repudiated his party, which opened his administration to violent criticism, and led a war on the easy divorce system of Pennsylvania. Economy and vigor marked his term. He was later president of the Historical Society of Pennsylvania, a trustee of the University of Pennsylvania and held positions of honor in various German and Netherlandish societies. He was author of ‹Pennslyvania in American History›; ‹Pennsylvania, the Keystone›; ‹Settlement of Germantown›; ‹Historical and Biographical Sketches›; ‹Annals of Phœnixville› and numerous other historical documents. In 1915 he was appointed chairman of the Public Service Commission of Pennsylvania, which office he held until his death.

PENOBSCOT BAY, pĕ-nŏb'skŏt, a bay on the southern coast of Maine. It is about 35 miles long and nearly 28 miles wide at its mouth. It is really an estuary, the current of the Penobscot River which flows into it being submerged. The tide waters extend beyond the head of the bay up the river for 20 miles. There are a number of small inlet harbors along the shores and it contains a number of islands, the largest being North Haven, Vinal Haven and Deer Isle.

PENOBSCOT EXPEDITION, in American colonial history the attempt of the Massachusetts Bay colonists in 1779 to dislodge a party of British from the peninsula of Majabagaduce, where the city of Castine, Me., now stands. A British force of 700 soldiers had come down from Nova Scotia, seized the peninsula and started to build a fort. It had already become evident that the American colonies were likely to obtain their independence and the fort in Penobscot Bay was intended to establish a northern limit to their territory. A force of 1,500 Americans were sent out from Boston in 19 ships, 13 of which were armed privateers, and three warships of the colony. A combined land and naval attack was planned. The land force debarked and gallantly assaulted the fort, which had been completed on only three sides. Three small British vessels closed the entrance to the harbor and made such a strenuous defense that the commander of the fleet, Captain Saltonstall, refused to attack. After a few days of fruitless action a British fleet appeared on the scene and forced the expeditionary ships to flee up the Penobscot. Three of the ships were captured and nine ships and seven brigs were burned to prevent their falling into the hands of the British. The Americans lost 474 in killed, wounded and prisoners. The losses of the British were 70 in killed, wounded and missing. The remainder of the expedition, including the commanders, made their way across the country to Boston where Captain Saltonstall and General Wadsworth were publicly censured. General Lovell was acquitted of blame.

PENOBSCOT INDIANS, a North American tribe of the Algonquian family, formerly residing along the both sides of the Penobscot Bay and the Penobscot River, in Maine. They were the most numerous and most influential tribe in the Abnaki Confederation. On the site of the present city of Bangor a chief village was established where the French founded a mission in 1688. The Penobscots took an active part on the side of the French in all the American colonial wars until 1749 when they made a peace treaty with the English. About 250 of these Indians remain, residing at Oldtown, a few miles above Bangor.

PENOBSCOT RIVER, a river in Maine, the headquarters of its western branch being on the northwest boundary of the State, in Somerset County, near the Canada line. It flows eastward into Piscataquis County and passes through Lake Chesuncook, then southeast through Lake Pamedumcook and the Twin Lakes, after which it receives the eastern branch, also known as the Seboois River, then east to the southwest corner of Aroostook County, where it turns and flows south by west to Penobscot Bay. It receives as its most important tributaries the Mattawaumkeag from the east and the Piscataquis from the west. It is about 350 miles long, the largest river in Maine, and navigable for large steamers for 26 miles from its mouth and for small river steamers for many miles higher up. The river is a swift-flowing stream along its upper and middle course and furnishes water power for many mills. In times past it was a noted salmon stream. The headwaters are in the pine forests and the rough timber is brought down to the mills by floating or rafting. The output of the winter's work in the lumber camps is thus brought to the lumber mills in the spring when the waters, ice-locked for several months, become free. It drains an area of 8,500 square miles. Bangor, at the head of tidal water, is the most important city on its banks. Other towns are Castine, Orrington, Bucksport, Belfast, Frankfort and Prospect.

PENOKEE RANGE, same as Gogebic Range. See Iron Ore Districts.

PENOLOGY. Penology (from Greek, ποινη, penalty or expiation, and λογος, theory or science), is the study of punishment for wrongdoing or for crime, both from its deterrent and reformatory aspects. It is often confounded with criminology, the study of crime, and is frequently used as synonymous with it. From a scientific viewpoint the study of penology is the study of the aims for which punishment may be inflicted. Punishment may be deterrent, preventive, retributive or reparative.

Under certain circumstances where the danger to the community is great and the temptation to commit the offense is strong, it is often believed to be necessary to impose punishment which is severe. The offender may, in such cases, be punished without serious consideration being given to his moral guilt or his responsibility. In such a case the culprit suffers for the sake of the community in order that his punishment may deter others from wrongdoing through the awakening of fear within them.

Punishment may be made preventative by the taking of the culprit's life or by shutting him up within prison walls permanently. The habitual criminal is frequently committed to prison for life. Strictly speaking, if the purpose of society in imposing such sentence is preventive, the word «punishment» is wrongly applied. In such cases society is usually attempting to protect itself and not to make the offender pay for his offense. The third purpose for which punishment is inflicted is to reform the offender himself. This aspect of punishment has been emphasized during this century. This form of punishment demands a radical change in many obsolete methods, including those of the old-fashioned prison with its antiquated administrative practices, equipment and administration. This form of punishment recognizes that the offender must be prepared to return to society through the building up of his physical well-being and of his moral life.

Punishment may be retributive in that it may be made to gratify the feelings of the person injured. Where the victim realizes that the law will swiftly and adequately punish the offender, he is slow to take action contrary to society's law. When on the other hand the victim feels the law will give him no redress, he may take things into his own hands and inflict punishment himself, or take part in its exercise, in accordance with the prompting of the mob mind, as in the case of lynching.

Finally, punishment is reparative when the wrongdoer is detected and punished in such a way as to gratify the disinterested feelings of moral indignation of the public.

In recent years the reformatory aspects of punishment have been emphasized almost to the exclusion of the other aspects because it is now believed that reformatory punishment includes deterrence, prevention, retribution and reparation either as inherent or incidental features. It is the only satisfactory and thoroughgoing form of punishment. In recent years, therefore, penology has been concerned more about the criminal than with his crime. Its aim is chiefly to make the punishment fit the criminal rather than the crime. Penology usually treats of methods of studying the individual offender in order to study his character. It assumes that he is abnormal; it emphasizes the necessity of discovering all the points of difference between him and the so-called normal man. Penology treats of the methods which may be used to determine the proper classification of the offender so that treatment of him may be based upon careful inquiry. It emphasizes all the different methods or systems of treatment which are calculated if possible to make him normal, that is, to render him capable of associating in free society with «normal» men. In a word, it aims to effect his rehabilitation. Penology also emphasizes and treats of the studies of the offender which should be undertaken in order to discover the causes of delinquency, so that society and government may be taught how to prevent the development of abnormal persons whom we call offenders or criminals. From this point of view penology concerns itself chiefly with preventive measures and only in a secondary sense with the rehabilitation of the offender.

The study of the individual offender has produced different classes of thinkers. Among the most interesting of these were the so-called «criminologists» led by Lombroso, the great Italian savant, who claimed that they had discovered a criminal type of «instinctive» or «born» criminal, a creature who had come into the world predestined to evil deeds, and who surely could be recognized by certain stigmata — certain physical, even moral birthmarks, the possession of which presumably ineradicable, foredoomed him to the commission of crime. The traits were defined as follows: «Various brain and cerebral anomalies; receding foreheads; massive jaws; prognathous chins; skulls without symmetry; ears long, large and projecting (the ear *ad ansa*); noses rectilinear; wrinkles strongly marked, even in the young and in both sexes; hair abundant on the head, scanty on the cheeks and chin; eyes feline, fixed, cold, glassy, ferocious; bad, repellant faces. Much stress is laid upon the physiognomy; and it is said that it is independent ot nationality; two natives of the same country do not so nearly resemble each other as two criminals of different countries. Other peculiarities are: Great width of the extended arms (*l'envergure* of the French); extraordinary ape-like agility; left-handedness as well as ambidexterism; obtuse sense of smell, taste and sometimes of hearing, although the eyesight is superior to that of normal people. ‹In general,› to quote Lombroso, ‹the born criminal has projecting ears, thick hair and thin beard, projecting frontal eminences, enormous jaws, a square, protruding chin, large cheekbones and frequent gesticulation.› So much for the anatomical and physiological or mental characteristics, so far as they have been observed. Moral insensibility is attributed to him, a dull conscience that never pricks, and a general freedom from remorse. He is said to be generally lacking in intelligence, hence his stupidity, the want of proper precautions both before and after an offense, which leads so often to his detection and capture. His vanity is strongly marked and shown in the pride taken in infamous achievements rather than personal appearance.»

Out of this study of the physique and appearance of the individual grew a celebrated system of identification called the Bertillon method, an invention of Alphonse Bertillon, who was born in Paris in 1853, which was adopted by penologists. Later, Sir E. R. Henry adopted the finger print system as a basis for the detection of crime by the identification of the criminal. Measurements of the skull, the cranium, the shape of the forehead, the face, the slant of the eye and the length of the forearm, were for a long time considered fundamental in studies of this sort. Such studies of externals probably reached their climax in the monumental work of Dr. Charles Goring, published in 1913, entitled ‹The English Convict,› in which he presents an intensive statistical study of 4,000 male convicts. Dr. Goring gave 12 years to the study of this data. His published work marks the close of an epoch in which penologists placed reliance upon external measurements to discover the character of the individual offender and the proper classification of the offenders.

The inadequacy of the system was established by Dr. William White in his review of Dr. Goring's book. He said: "Taking the more limited concept of 'thief,' one man may steal under the influence of the prodromal stage of paresis, who has been previously of high moral character; another man may steal under the excitement of a hypodermic attack; another may steal as a result of moral delinquency; another as a result of a high-grade mental defect; and another under the influence of alcoholic intoxication, etc., and so on; and how by any possibility a grouping of these men together can give us any light upon the general concept of 'thief' is beyond my power to comprehend."

In more recent years penology has been profoundly influenced by the development of modern scientific studies in the fields of botany, anthropology, physiology, psychiatry, neurology, pathology and bacteriology. Penology is not a science but is rapidly assuming many of the aspects of science. It has leaned heavily upon all of the sciences and has utilized the methods developed in such diverse fields as are represented by such subjects as education, public health work, sanitation, engineering and architecture.

At the present time the methods for studying the individual adopted by hospitals for the insane have been adopted by penologists not only in studying but also in treating the offender. The monumental study of offenders which is the product of the use of such methods of study is Dr. William Healy's 'The Individual Delinquent,' which strangely enough was published in 1913, the same year that Dr. Goring brought out his monumental work. The adoption of these methods was brought about naturally in a course of years and for several years the penal codes of some of the American States have recognized different degrees of accountability in determining the punishment for crime. Many of them provide that the criminal who is insane is not responsible for his actions, but only very recently has the idea been extended to other forms of insanity such as feeble-mindedness and epilepsy. This broadening of the field of investigation to determine responsibility has led penologists to give attention to hereditary and to environmental factors in determining the criminal's responsibility under the statutory and moral law.

As a preliminary to the study of crime, penology insists upon a study of the individual offender to ascertain: (1) His exact identity; (2) the salient facts concerning his family history; (3) his environment; (4) his criminal record; (5) his mental and physical condition; (6) his attitude toward society; (7) any circumstances which call for leniency or severity in his case.

When these facts have been determined, then the study of penology emphasizes the necessity for classification of the offender so that he may be dealt with intelligently. His case is studied to ascertain: (1) His physical and mental status; (2) his physical and mental age; (3) his character and conduct; (4) the nature and cause of his delinquency; (5) the training he requires to fit him for his return to society.

There are those who are handicapped mentally or physically, or both; there are the inebriates, the habitually idle, the unskilled, the youthful and the aged; there are those who are old in body but children in mind. From the viewpoint of character and conduct, there are the capable and the hopeful, the capable and wilfully delinquent, and the incapable and the unfit. From the standpoint of the nature and cause of the delinquency, there are the casual and environmental and social offenders, the constitutional or habitual offenders and the symptomatic offenders. These latter are interesting cases. They are usually the assassins of our Presidents, the poor derelicts who imagine themselves as rich as Crœsus, the perverts, the degenerates and the parasites.

For the public welfare, and in order that the proper methods and places of treatment may be provided for offenders, penology treats of prisons and institutions and of methods of conducting them so that society may be protected adequately and safeguarded thoroughly, and, further, so that the individual offender may be reformed. Great diversity of treatment is required, which calls for wide differentiation in prison architecture, prison location, prison equipment and prison administration, including discipline.

Institutional government or discipline has imitated but has lagged behind the development of government in the outside world. The different forms of government or discipline may be divided as follows: (1) The autocratic; (2) the benevolent despotic; (3) the mixed autocratic and benevolent despotic; (4) the mixed benevolent and Hamiltonian republican; (5) the Jeffersonian democratic.

In reviewing carefully the development of government and discipline of correctional institutions, more or less pure examples of each of the foregoing types of government are in evidence. In the case of the autocratic form of discipline, which is distinctly a repressive system, the individual is subordinate entirely to the will of the superior government. In this way it is a pure autocracy, modeled after the severest examples of the autocratic state. The benevolent despotic system was carried out by Sir Walter Crofton, director of Irish prisons, from whom it gained its name. Under this system, the superintendent of a prison is a benevolent despot, but his despotism is tempered with both benevolence of purpose and expediency of action. Another development of discipline which has characterized some of our older reformatories and better State prisons was partly autocratic and partly despotic. While to outward appearances the discipline is conducted according to the autocratic system, kindness and cheerfulness so permeate the plan as to provide work and activities which are developmental and reformative in character. In the case of the so-called mixed benevolent and Hamiltonian republican system, classification and promotion are based on individual effort and self-government is granted as far as possible to that group which is deemed deserving and capable of exercising such control. The Jeffersonian democratic system is the self-government plan of control. It is a system which may be applied in special institutions where the best prisoners are collected, that is, institutions from which the incorrigible, the low grade, feeble-minded, the degenerate, the seriously abnormal, the insane, the old rounders and the feeble inebriates have been removed.

The best type of prison government is that which is best synchronized with the stage of development with the group of offenders to which it is applied. The aim of penology is to determine the form of government which is best suited to meet the needs of the particular individual under consideration. It emphasizes the necessity for the proper equipment to meet the needs of the particular kind of government which is instituted.

Under the stimulus of the idea of probation, judges were lead to regard institutional treatment as a last resort, as a hopeless refuge of the hopeless offender. More recent studies have demonstrated the inadequacy of such treatment, so that modern penologists insist that the offender shall be carefully studied and his treatment determined in the light of such a study. If his condition demands and warrants release instead of commitment to an institution, then he is recommended for release. If he is in need of hospital treatment or of training, then he is sent to an institution equipped properly to furnish treatment or education, or both.

The penalty as exacted by society in accordance with the teachings of modern penologists is claimed by them to be not less but more severe than the penalty exacted in accordance with the so-called old penology, which attempted to mete out the exact amount of punishment to balance the offense. Under that system, the culprit «paid the penalty» and then was free. Under the more modern system, he is to be deprived of his right to direct himself until such time as he is able and willing to conduct himself normally in accordance with the will of society as it is expressed through government. According to the teachings of this branch of penology, the mere surrender of freedom acts as a more powerful deterrent to the individual than any of the old forms of punishment. Retribution is made to the satisfaction of the victim and of society under a system of treatment through a period of time in such a way as not to offend the better impulses and instincts of any. Under this branch of penology the study of a person being thus punished may also yield results of great value in correcting environmental conditions which are found to be productive of crime.

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PEÑÓN DE CORÓN, pā-ñōn' dā kō-rōn', or «**CROWN PEAK,**» now known as **CORON ISLAND,** an island of the Calamianes group of the Philippines, lying south of the eastern extremity of Busuanga Island and northeast of Palawan; area, 42 square miles. It is a rocky and precipitous peak 1,200 feet in height, 10½ miles from north to south and six miles across its northern end. The southern end terminates in a sharp, steep point called Calis. The soil is sterile and unfitted for agriculture, and the chief employment of the inhabitants is the gathering of edible birds' nests, composed of the salivary secretions of the swift (q.v.). The birds' nests of Peñón de Corón are of the finest quality and are unrivaled in the market, the Chinese paying double their weight in silver for them. The nests from Coron are nearly always entirely free from foreign substances. On the neighboring islands, also frequented by the swifts, the birds add grass and bits of moss to their nests, which consequently bring much lower prices.

PENROSE, Boies, American lawyer and politician: b. in Philadelphia, 1 Nov. 1860. He was graduated from Harvard College in 1881; read law with Wayne MacVeagh and George Tucker Bispham, and was admitted to the bar in 1883. He then practised his profession in Philadelphia for several years; was elected to the Pennsylvania House of Representatives from the eighth Philadelphia district in 1884; to the Pennsylvania State senate from the sixth Philadelphia district in 1886, re-elected in 1890 and again in 1894; was elected president pro tempore of the senate in 1889, and re-elected in 1891. He was a delegate to the Republican National Conventions of 1900, 1904 and 1908; was chairman of the Republican State Committee in 1903–05; was elected a member of the Republican National Committee from Pennsylvania in 1904 and re-elected in 1908; was elected to the United States Senate, to succeed J. Donald Cameron, for the term beginning 4 March 1897; re-elected in 1903, 1909 and 1914. His term of service will expire 3 March 1921.

PENSACOLA, pĕn-sạ-kōlạ, Fla., city and county-seat of Escambia County, on the west shore of Pensacola Bay, 10 miles north of the Gulf of Mexico, 48 miles east of Mobile and 204 miles west of Tallahassee. It is on the line of the Louisville and Nashville and the Pensacola, Mobile and New Orleans railroads. The city has an excellent land-locked harbor with from 30 to 33 feet of water on the bar. The climate here is mild and very healthful, the sanitary and quarantine regulations precluding any danger from yellow-fever. The city has gas, electric-light, water and street railway plants. There is a United States navy yard at Warrington seven miles nearer the Gulf and two forts, Pickens and McRee, at the entrance to the harbor, and Fort Barrancas within. The remains still exist of the old Spanish forts of San Bernardo and San Miguel. There is a State armory, Federal government building, opera-house, courthouse and 11 public school buildings. Pensacola is a considerable commercial centre, having a large domestic trade in lumber, fish, naval stores, hides, tallow, cotton, wool, iron, phosphate and coal. There are a commercial fertilizer factory, several cotton presses, sawmills and planing mills. The city has three national and several private banks. Since 1910 extensive developments have been in progress, many large and handsome buildings erected, among them some great hotels; and a series of beautiful parks laid out.

Pensacola Bay was visited in 1528 by the Spanish explorer, Panfilo de Narvaez. The first settlement there was in 1559. The city was first permanently settled in 1696, by a colony of Spaniards from Vera Cruz, Mexico. In 1719 it was captured by the French, but was restored to Spain in 1723. The British secured possession of the town in 1763, but in 1781 it was again captured by the Spanish. In the War of 1812 (q.v.) it was taken by General Jackson. The United States took permanent possession of the city in 1821, in accordance with the treaty of 1819. The navy yard was soon afterward established. Pensacola had a population in 1890 of 11,750 and in 1900 of 17,750. The population in 1910 was 22,982. In 1918, including the suburbs, it was estimated at 31,950.

PENSACOLA BAY, an inlet of the Gulf of Mexico in the western part of Florida, extending 25 miles inland and covering about 200 square miles. The northern extension of the bay divides into two parts, West Bay extending up the valley of the Escambia River, and East Bay with two branches extending up the Blackwater and Yellow rivers. It is only one mile wide at the entrance between Santa Rosa Island on the east and the mainland on the west; the bar has 30 to 33 feet of water. Pensacola Bay proper is about 10 miles wide; it is land-locked and affords an excellent harbor. On the western shore, 10 miles from the entrance, is the city of Pensacola. A United States navy yard and naval hospital are at Warrington, also on the west shore and about three miles from the entrance. The bay is defended by Fort Pickens on the Santa Rosa Island and Fort McRee on the outer bar attached to the mainland, and Fort Barrancas on the inner shore of the bay.

PENSACOLA BAY IN THE CIVIL WAR. After the secession ordinance of 10 Jan. 1861, the State authorities seized Fort McRee, Fort Barrancas, north of it, and the navy yard on the west shore, and demanded the surrender of Fort Pickens, located on Santa Rosa Island to the east of the entrance to the bay. But it was resolutely held by Lieut. A. J. Slemmer and a small body of United States regulars, which soon were reinforced by a detachment of Wilson's Zouaves of New York and a small blockading squadron. The garrison and marines made night raids on the navy yard, on 2 September burning the dry dock, and on the 13th burning a vessel fitting out as a privateer. The Confederates in turn attempted to surprise and capture Wilson's troops. For this purpose an expedition of 1,000 men under Gen. R. H. Anderson crossed over to Santa Rosa Island and landed several miles east of Fort Pickens. It was the early morning of 9 October. Anderson divided his force into three battalions, one 260 strong under Col. John K. Jackson, the rest about evenly divided under Cols. James Chalmers and J. Patton Anderson respectively.

After a march of three or four miles, the shooting of a sentinel by some one of Chalmers' command gave the alarm to the Federal camp. Jackson's battalion of Georgians then pushed through thickets to the middle of the island, driving the Federal outposts before them and stormed the camp, which they found deserted. Here they burned the storehouses and sheds. As daylight came before arrangements could be made for further concerted action, General Anderson ordered all back to the boats. During the withdrawal a sharp skirmish occurred with two companies of Federals that attempted to intercept the retreat. While the troops were embarking, an unavoidable delay enabled the Federals to come up and open fire, by which several Confederates were killed or wounded. The total Confederate loss in this affair was officially stated as 18 killed, 39 wounded and 30 captured. The total Union loss reported was 64.

PENSÉES. Pascal's ‹Pensées,› or ‹Thoughts,› have been called the greatest masterpiece in French prose. Yet the work is incomplete, even fragmentary, and it is impossible to say what was in detail the author's proposed argument. Pascal had long planned a great work on religion which should express from his point of view its defense or justification. The period was one of great religious turmoil, characterized not only by the disputes of the Jesuits and the Jansenists, but also by what was considered the subtly corroding influence of the wordly indifferentists or unbelievers, known as «libertines.» It was to a considerable degree against these last that Pascal's projected work was directed. He also wished to refute the scientists who, in his opinion, allowed too much power to the freedom of lay and independent rationalism. He had all the ardor of the new convert, and only illness and early death prevented him from completing this great apology of his faith.

There were many difficulties in the way of posthumous publication. Pascal's nephew brought out the first edition in 1670, in which the material was somewhat arbitrarily arranged. For over a century this remained the standard version, but now it is possible to read the ‹Pensées› both in reprints of the disorderly primitive manuscripts and in new systematic classifications more suited to modern readers.

Pascal was influenced in the composition of the 'Pensées' by such works as the Bible and the writings of Jansenius, as well as by lay authors like the sceptical moralists, Epictetus and Montaigne, whose arguments Pascal used to justify his own progress from scepticism to faith.

The underlying concept of Pascal in the 'Pensées' is that man stands in the midst of nature apparently a helpless victim of cruel and ruthless forces. Yet he has an inward conviction that there must be some motive for this state of things. We get consolation and even comfort if we are willing to believe that our suffering expiates the sin of our first parents' wrongdoing. This conviction is reached, not merely by cold reasoning but by an inner feeling or intuition, and it throws us headlong and lovingly into the arms of faith.

To-day so many of Pascal's thoughts have become familiar by frequent repetition and have so entered into the commonplaces of literature that we find it difficult to realize their profundity and novelty in his own day. Some passages extend over several pages, some are mere unfinished scraps, some, indeed, occur in duplicate or triple form, but they are full of personal and religious feeling expressed in lyric prose. Therefore, however little some persons may sympathize with what they consider the morbid and neurotic sensitiveness of Pascal, none the less he has an irresistible appeal to many. At no time has he been more studied than now when the reaction against the scientific, materialistic rationalism of the 19th century has led many philosophers to draw parallels between their religious position and that of Pascal.

Important modern editions of the 'Pensées' are those of L. Brunschvig (two editions, 1897 and 1904, small and large), with a reclassification of the text; Michaut, G. (1896), a reprint of the manuscript; Gazier, A. (1907), reprint of the text of the first edition. Consult also other editions by Havet and Fougère.

Charles H. C. Wright.

PENSIONS. A pension is in its essence a gratuity, and as such is to be sharply distinguished from any form of insurance, to which the beneficiary contributes. The idea has been advanced that a pension is to be considered a deferred payment of salary — on the understanding that the salary had been an inequitable compensation. The courts have not sustained this view but have ruled that there is no inherent right of the pensioner to the pension, but that it is charity pure and simple. In its specific form, however, it is generally recognized as being a reward for continuity of service — a protection extended to a faithful employee when he is no longer able to remain effectively at his post as in the case of civil service and police pensions; or as a tangible recognition of a valuable service rendered to the state, as in the case of maternity pensions and military pensions.

The several systems of pensions which have been developed from charitable and socialistic investigations may be grouped largely into two classes: public and private. The former includes (1) old age pensions; (2) invalid or disability pensions; (3) maternity pensions; (4) widows' or mothers' pensions; (5) civil service pensions; (6) municipal pensions; (7) military pensions; (8) teachers' pensions. The latter includes various systems of pensioning retired clergymen and college professors, and the industrial or employees' pensions of private concerns. All systems which are based in whole or in part, directly or indirectly, upon voluntary or compulsory contributions by the beneficiaries belong properly to the domain of insurance (q.v.).

Old Age Pensions.— The idea of the old age pension system is to do away with the wholly unsatisfactory almshouse as the ultimate refuge of the dependent aged by providing them with means of retaining their own individual homes. The basic principle of such pensions is well set forth in the preamble to the New Zealand Pension Act, thus: "It is equitable that deserving persons who, during the prime of life, have helped to bear the public burdens of the Colony by payment of taxes, and to open up its resources by their labor and skill should receive from the Colony a pension in their old age." The pension under the New Zealand law, which may be instanced as typical, and the most generous of all, is up to a maximum of $2.50 per week, or $130 a year. It is payable to all persons except Chinese and other Asiatics, and civil service employees (otherwise provided for) reaching 65 years of age and who have been residents of the colony for 25 years, and who have for the five years immediately preceding application lived a sober and reputable life; whose income does not exceed $250 a year, and whose accumulated property does not exceed $1,300. Under these conditions about one-third of the persons of 65 years of age and over in the colony are recipients of pensions.

In Australia similar laws are in force for men of 65 and women of 60, if of 20 years' residence. In Victoria, however, there is a condition that no pension shall be given to such persons as are physically able to earn their living. In New South Wales a graduated pension is paid, the maximum of $130 per annum to a pensioner whose income does not exceed $130 per annum, and decreasing as the private income increases, so that those who receive privately $260 per annum are not entitled to any pension. The pension is also reduced by another scale based on the value of personal property owned by the applicant. Any one owning $1,950 in property, although without a stated income, is not entitled to draw a pension.

By the revised (1908) Pension Act of Great Britain a pensioner must be at least 70 years old, and have been a British subject for at least 20 years. His yearly income must not exceed $156. The pension is scaled according to the private income and ranges from a minimum of 24 cents up to a maximum of $1.20 a week, the aggregate of the income and pension not to exceed $3.12 per week.

In the United States two unproductive attempts have been made within recent years to establish an old age pension system. The Wilson bill (61st Cong. 2d sess., H. R. No. 14494) introduced 14 Dec. 1909, proposed the organization of all persons of 65 years upward into the "Old Age Home Guard of the United States Army"; enlisting both men and women who had been residents of the United States for 25 years, and citizens for 15 years, and who were possessed of less than $1,500 of property, and with an income of less than $240 per annum. The «pay» of «privates» in this army was to be $120 per annum, subject to certain deductions in case of a private income larger than $300 per year. The Berger bill (62d Cong. 1st sess. H. R. No. 13144) introduced 31 July 1911, aimed to provide a pension for all persons reaching 60 years of age, and having been citizens of the United States for 16 years; and whose average income for the previous year had not been more than $6 a week. The pension in such case was to be $4 a week. In case of a larger private income the pension should be reduced accordingly, so that the aggregate of income and pension should not exceed $10 per week. In the case of a married couple not legally separated, and both of pension age and circumstances, the pension of each should be three-fourths of the standard pension for a single person.

In Canada a government annuity system takes the place of an old age pension. In France and Germany the pensioner is required to contribute during his productive years, the government and the employer each contributing also to the pension fund. This is actually old age insurance.

Invalid Pensions.—A disability or invalid pension is one granted to a person permanently disabled by disease or injury. The invalid pension system of Australia is typical, and is the best purely gratuitous system so far developed. The applicant must have attained the age of 16 years, and have been continuously a resident for at least five years. He (or she) must be permanently incapacitated for work and have been incapacitated while in Australia. The rate of the pension is fixed by the commissioner or one of his deputies, and must not exceed $130 per annum; and the aggregate income of the pensioner, including the pension, must not be over $260 per annum. Australia began to pay invalid pensions 15 Dec. 1910. On 30 June 1917 there were 26,781 of these pensions current, 157 of these being paid to persons of 16 years of age, of whom 76 were males and 81 females. Of the whole number, 93.6 per cent received the maximum pension of $6.25 every fortnight. During the year 5,142 pensions had been granted, 2,729 to males and 2,413 to females. The fortnightly expenditure amounted to $164,475.

In Great Britain the old age pensions are made to apply to persons incapacitated at an age below the standard age at which applications may be made. There is also a similar provisioin in the Civil Service Pension Law.

In the United States «invalid pensions» are paid to men in the military service who are disabled by wounds or by disease contracted while in the service. These pensions are distinguished only in classification from the regular military «service pension.»

Maternity Pensions.— The maternity pension is one given to a woman at and for a time following the birth of her child. It is considered a better provision than the medical and surgical advice given gratuitously in some countries. It may be given as a lump sum, or in a series of weekly payments continuing from 2 to 12 weeks, and in some cases beginning two weeks before the birth. In Great Britain and Australia it is paid in one specified sum. In Switzerland and France it is a serial payment running from 4 to 12 weeks, or during the «nursing» period. By the Netherlands law of 1913 and the German law of 1915 the aid is given for three months after the birth. In some other countries, as Rumania and Denmark, the mother is required to contribute the whole fund from her wages, to be paid back to her when her child is born. In most countries a provision for aid at maternity is a part of the scheme of health insurance, and hence not a pension.

Widow's Pensions, called in some localities «mothers' pensions,» are intended to provide a widowed mother, or one divorced or deserted, with the means necessary to keep her family together, and to bring up her children at least to the age of 16 years. In some States the «mothers' pension» is granted to the mother when the father is incapacitated for work. The term is doubtless a misnomer, the expressed intent being care of the children, and «children's pension» would more accurately describe the gratuity. The usual requirements are that the child shall live with the mother: that the mother is a proper person physically and mentally to bring up the child; and that except for the pension the child would have to be sent for support to a public institution. The first widows' pension law in the United States was passed by the Missouri legislature in 1911. It was general in character, but by its limitations as to population, it applied only to Kansas City. In the same year Illinois passed a broader law. The idea has spread rapidly and at the close of 1917 31 States had adopted it, and a provision of some kind for widows with dependent children had been incorporated into their statutes. These States are Arizona, California, Colorado, Florida, Idaho, Illinois, Iowa, Kansas, Maine, Massachusetts, Michigan, Minnesota, Missouri, Montana, Nebraska, Nevada, New Hampshire, New Jersey, New York, North Dakota, Ohio, Oklahoma, Oregon, Pennsylvania, South Dakota, Tennessee, Texas. Utah, Washington, Wisconsin and Wyoming. A comprehensive digest of these various State laws may be found in the editions of 'The World Almanac.'

Civil Service Pensions are those granted to employees of the State upon their superannuation, or, in some cases, on the abolition of an office which had been adequately and faithfully administered by the displaced official. It is commonly graduated upon a basis of continuous service for a certain minimum period. In the English law the pensioner must have served at least 10 years and be over 60 years when retired, or, if under 60 he must be certified as permanently incapable of discharging his official duties. The pension is figured on a basis of 1/80 of his former salary for each year of service, not to exceed in all 40/80. There is also a provision for a graduated bonus in addition, based on the length of service, but this forms no part of the pension.

In the United States the only civil service pensions are those granted to Federal judges, who may retire after 70 years of age. The pension is equal to the salary where the length of service has been 10 years or more. Eight of the States similarly pension their retired judges.

Municipal Pensions.— In the United States the only municipal pension systems are for the police and firemen, the principle involved being that the men constituting these forces are often called upon to risk their lives or their health for the benefit of the community which they serve. The city of Rochester, N. Y., also pensions the widows and children of policemen or firemen who lose their lives in the discharge of their duty, and of those who are incapacitated while on duty. Some 300 American cities have municipal pension systems, but in some of them the fund is in part contributed by the members of the force on a fraternal insurance plan. In the principal European cities the pension is wholly gratuitous, and is equal to the former salary. In the United States the retirement pension is generally half the former salary.

Military Pensions are those granted to soldiers and sailors of the army and navy, for service of the State under hazard. In the United States, pension legislation was first enacted by the different States, for the relief of those who were wounded or disabled in service during the War of the Revolution, but in 1789 by an act of Congress the general government assumed the payment of such pensions as had been granted by the States, and this provision was continued by subsequent legislation. Later on, pensions were granted to the widows of Revolutionary soldiers, and in 1861 the pension rolls contained the names of 63 survivors of that war and 2,728 widows of Revolutionary soldiers. The last survivor was Daniel F. Bakeman, of Freedom, Cattaraugus County, N. Y., who died 5 April 1869, aged 109 years six months and eight days. On 30 June 1910 the rolls still contained the name of one daughter of a Revolutionary soldier, the daughters having been pensioned by special acts of Congress. The amount disbursed to Revolutionary pensioners up to 30 June 1916 was approximately $70,000,000.

War of 1812.— On 14 Feb. 1871 an act was passed by Congress granting a pension of $8 per month to the survivors of the War of 1812 who rendered a service of 60 days, and to their widows provided they were married to such soldiers or sailors prior to the treaty of peace 17 Feb. 1815. The act of 9 March 1878 reduced the period of service to 14 days, and made no limitation as to date of marriage in case of widows. By subsequent legislation the pension to widows was increased to $12 per month. On 30 June 1916 the pensioners of the War of 1812 were 115 widows. The amount disbursed under said acts up to 30 June 1916 was $45,991,744.

Indian Wars.— On 27 July 1892 Congress enacted a law granting pensions to those who served 30 days in the Black Hawk, Creek, Cherokee and Florida War with Seminole Indians from 1832 to 1842 and to their widows. On 27 June 1902 the benefits of this act were extended to the survivors of the Florida and Georgia Seminole Indian War of 1817–18; the Fevre River Indian War of Illinois of 1827; the Sac and Fox Indian War of 1831; the Sabine Indian disturbances of 1836 and 1837; the Cayuse Indian War of 1847–48 on the Pacific Coast; the Florida wars with the Seminole Indians from 1842 to 1858; the Texas and New Mexico Indian War of 1849–56; the California Indian disturbances of 1851–52; the Utah Indian disturbances of 1850–53, and the Oregon and Washington Territory Indian wars from 1851 to 1856, and to their surviving widows. The pension is fixed at $8 per month. The number of pensioners on the rolls under these acts on 30 June 1916 was 2,578, consisting of 676 survivors and 1,902 widows; the amount disbursed thereunder up to said date was $13,790,299.

Mexican War.— By an act of 29 Jan. 1887 Congress granted a pension of $8 per month to the surviving soldiers and sailors of the war with Mexico, provided that they actually served 60 days with the army or navy of the United States in Mexico, or on the coasts or frontier thereof, or en route thereto, in the war with that nation, or were actually engaged in a battle in that war, and were honorably discharged; and to such officers and soldiers and sailors as may have been personally named in any resolution of Congress for any specific service in the war; and to the surviving widows of such officers and enlisted men. The conditions under which title is granted under the act are that the soldier or sailor must be 62 years of age, or if under that age he must be disabled from causes not incurred while in any manner voluntarily engaged in or aiding or abetting the late rebellion against the authority of the United States. The provisions of this act were subsequently extended to Powell's Battalion of Missouri Mounted Volunteers and to Gray's Battalion of Arkansas Volunteers, and by the act of 3 March 1903 the pension to survivors was fixed at $12 per month. Widows of officers and enlisted men who served as above stated are entitled to pension on the same conditions as to age, disability or dependence, as apply to such officer or soldier, but their pension is not subject to increase, nor are the descendants of survivors entitled to pension under those acts. The number of Mexican War pensioners on 30 June 1916 was 4,298, consisting of 513 survivors and 3,785 widows, and the total payments to them on that date had amounted to $50,422,229.

Civil War.— There are two distinct systems of pensioning on account of service in the Civil War. Under the acts of 14 July 1862 and 3 March 1873 any officer, soldier, sailor or marine, disabled by reason of wound or injury received or disease contracted in the service of the United States, and in the line of duty, may be pensioned for such disability during its continuance. In case of his death from causes originating as above set forth, his widow or his child or children under 16 years of age become entitled to pension. If he left no widow, or child under 16, his dependent mother, father, or orphan sisters and brothers are entitled in the order named.

Under the acts of 27 June 1890 and 9 May 1900 any officer, soldier, sailor or marine who served 90 days or more in the military or naval service of the United States during the war of the Rebellion, who had been honorably discharged therefrom, and who was suffering from disability of a permanent character, not the result of his own vicious habits, which incapacitated him from the performance of manual labor in such a degree as to render him unable to earn a support, was entitled to pension under these acts of not less than $6 per month nor more than $12 per month.

In case of the death of any person named above, his widow becomes entitled to pension, provided she married him prior to 27 June 1890, and that she is without other means of support than her daily labor. If she remarries or dies, the child or children of such soldier or sailor under the age of 16 years become entitled. The act of 9 May 1900, which is an amendment of the act of 27 June 1890, provided that in determining inability to earn a support each and every infirmity shall be duly considered, and the aggregate of the disabilities shown be rated. It is also provided that a widow may have title to pension if she is left without means of support other than her daily labor and an actual net income not exceeding $250 per year. On 30 June 1916 there were 362,277 invalid pensioners of the Civil War and 286,080 widows, minor children and dependent relatives. The amount of money paid to pensioners of the Civil War up to 30 June 1916 was $4,765,075,021. The rates of pensions to invalids under the general law range from $6 per month to $100 per month, there being various intermediate rates for different degrees of disability. The rates of pensions to widows and dependents range from $8 per month to $30 per month and are governed by the rank held by the husband on the date his fatal disease was incurred in the service. In 1918 an amendment was made to the General Pension Act of 11 May 1912, reading: «From and after the passage of this act the rate of pension for any person who served ninety days or more in the military or naval service of the United States during the Civil War, now on the roll or hereafter to be placed on the pension roll and entitled to receive a less rate than hereinafter provided, shall be $30 per month. In case such a person has reached the age of seventy-two years and served six months, the rate shall be $32 per month; one year, $35 per month; one and a half years, $38 per month; two years or over, $40 per month: Provided «That this act shall not be so construed as to reduce any pension under any act, public or private.»

The Supreme Court of the United States has decided that «no pensioner has a vested legal right to his pension. Pensions are the bounties of the government, which Congress has the right to give, distribute, or recall at its discretion.»

An act of Congress, approved 21 Dec. 1893, provides, however, that a pension shall be deemed and held by all officers of the United States to be a vested right in the grantee to that extent that payment thereof shall not be withheld or suspended until after due notice to the grantee of not less than 30 days, the Commissioner of Pensions shall decide to annul, vacate, modify and set aside the decision upon which such pension was granted.

Laws have been enacted from time to time for the purpose of protecting pensioners from any diversion of their pensions either by their own acts or by the acts of others. Any pledge, mortgage, sale, assignment or transfer of any right, claim or interest in any pension shall be void and of no effect. The holding of a pension certificate as collateral security for any debt or promise, or the retention of a certificate and refusal to surrender it upon proper demand, are misdemeanors, and punishable by heavy fine, upon conviction.

War with Spain and Insurrection in the Philippine Islands.— The provisions of the acts of 14 July 1862 and 3 March 1873 apply to those who served in the war with Spain and the insurrection in the Philippine Islands, and up to 30 June 1916, 28,472, including invalids, widows and dependents, had been pensioned on account of such service, and 1,164 special pensions had been granted. The amount disbursed to them was $53,744,668. An act of 1918 provides for widows and minor children of officers and enlisted men who served 90 days or more in the War with Spain, the Philippine insurrection, or in China. The law grants a widow without means of support other than her daily labor and an actual net income not exceeding $250 per year, $12 per month during widowhood, and $2 per month for each child under 16, until 16 unless insane, idiotic or otherwise permanently incapable. For the comprehensive scheme of insurance, allotments, pensions, etc., in the War of 1914–18 see War Risk Insurance.

Regular Establishment.— The acts of 14 July 1862 and 3 March 1873 also apply to those who have served in the army and navy in time of peace since 4 March 1861, and to those who are now in the military or naval service. The number of pensioners on the roll of the regular establishment on 30 June 1916 were distributed as follows: invalids, 15,553; widows, 2,937; minor children, 221; dependent mothers, 1,208; dependent fathers, 169; brothers, sisters, sons and daughters, 6; helpless children, 8; a total of 20,102. The total amount disbursed to 30 June 1916 in this classification was $39,098,319.

Army Nurses.— Under the act of 5 Aug. 1892 all women employed by the surgeon-general of the army as nurses, under contract or otherwise, during the late War of the Rebellion for a period of six months or more, and who were honorably relieved from such service, are granted a pension of $12 per month, provided they are unable to earn a support. On 30 June 1916 the pension rolls bore the names of 252 pensioners under this act.

Total Disbursements for Pensions.— From 1 July 1790 to 30 June 1865, a period of 75 years, the disbursement for pensions amounted to $96,445,444.23. From 1 July 1865 to 30 June 1916 the disbursements for the payment of pensions were $4,993,114,894, making the actual total disbursements in pensions since the beginning of the government $5,089,560,338. Adding to this amount the cost of maintenance, namely, $131,375,055, it will be seen that the pension system since the foundation of the government has cost $5,220,935,393, which sum is exclusive of the establishment of soldiers' homes.

Number of Soldiers and Sailors of the Various Wars.— Revolutionary War, 184,038; War of 1812, 286,730; Mexican War, 78,718; Indian wars, 83,993; Civil War, 2,213,363; Spanish War, 312,000; Philippines and China, 146,151; total 3,304,993. The average pension paid to each enlistment has been $919.

Pension Agencies.— Pensions are paid quarterly through the 18 pension agencies located in different parts of the country. The President is authorized by law to establish agencies for the payment of pensions, wherever, in his judgment, the public interests and the convenience of the pensioners require. Pension agents are appointed by the President by and with the advice and consent of the Senate, and they are required to give bond, with good and sufficient sureties, for such amount and in such form as the Secretary of the Interior may approve.

Teachers' Pensions.— In the United States only five States have granted State-wide gratuitous pensions to teachers. They are Arizona (1912); Maine (1913); Maryland (1902); New Hampshire (1915); and Rhode Island (1907). In Maryland, the pension begins after 25 years of service, and the amount is $200 a year; in Rhode Island the pension begins after 35 years of service and the amount is half of the average annual salary for the five years next preceding; but must not exceed $500 per year. New Jersey has two pension laws; the one in force previous to January 1908, and applicable only to teachers in service previous to that date is in terms the same as that of Rhode Island. The other law provides for teachers' compulsory contributions. Virginia makes annual contributions of State funds to the pension fund, but requires a contribution from teachers of 1 per cent of their salaries. Massachusetts permits all cities except Boston to pension their teachers if the people so decide at the polls. Boston has a small private fund of its own. Alabama in 1915 passed a pension law permitting the pensioning of teachers in communities of more than 80,000 and less than 82,000 population. These figures limited the application of the law to Mobile County.

In Europe nearly all countries have teachers' pension laws in operation. Russia's law dates from 1819; England's from 1848; France's from 1858. Other countries in which such laws are in force are Australia, Austria, Belgium, Finland, Ireland, Japan, Norway, Serbia, Spain, Sweden and Switzerland. In South America, the Argentine Republic and Chile have most generous teachers' pension laws. In Canada the provinces of Ontario and Quebec must be included in the list. In Mexico, also there is a non-contributary provision for retired teachers.

Among the private pension systems are many for retired teachers from famous schools, notably in England. The other classes of private pensions as noted above are as follows:

Clergymen's Pensions.— These are paid from the private funds of the church organizations in which the pensioner has been active. In England where the Church is a state institution the pension is called «Ecclesiastical,» and under the peculiar conditions is a public pension.

Collegiate Pensions.— The principal provision for the pensioning of college professors is «The Carnegie Foundation for the Advancement of Teaching.» This organization was incorporated by an act of Congress and approved by the President 10 March 1906, with the avowed purpose of providing retiring pensions «for the teachers of universities, colleges, and technical schools in the United States, Canada and Newfoundland, who are in need of the aid, and who have not served in sectarian institutions.» It is a duty of the administrators to approve the institution from which the applicant comes as one of college grade. There is an age limit of 65 years, and 15 years of service, but the rules are not rigid, each case being judged on its merits. Provision is also made for the widows of pensioners. The «retiring allowance» as the pension is termed is not to exceed 80 per cent of the salary previously received and in any case cannot exceed $4,000. The average pension has been about $1,600. The number of pensioners is about 350 and the annual expenditure about $550,000.

Industrial Pensions.— The effect of the pensions granted to the employees of the larger industrial concerns has been to ensure the continuance of experienced men in their service. It is thus a benefit to the employer as well as the employee, and experience has shown that the system can be carried at an expense of only 1 per cent of the wage scale. In some of the establishments where the system has been introduced, the employees have been asked to contribute half of the expense, but in the large majority of cases the pension is wholly gratuitous. The American Express Company's plan is typical. It is in amount half of the average salary for the preceding 10 years, and is paid to an employee for not less than 20 years' service when he becomes incapacitated through age or injury while in the company's service. Other industrial concerns who provide pensions for their aged employees are the E. I. du Pont de Nemours Powder Company, the Gorham Manufacturing Company, the International Harvester Company, the Philadelphia Electric Company, the Public Service Corporation of New Jersey, the Standard Oil Company, the United States Steel Corporation, Wells, Fargo and Company, and the Westinghouse Air Brake Company. The Armour Company and Morris and Company are conspicuously in opposition to the gratuitous pension. They require a 3 per cent contribution to the pension fund from all their employees except unmarried women.

Nearly all the transportation companies retire their long-service employees with pensions, at 60 years if they ask it, and at 65 years under compulsion. The system adopted by most railroads is on a basis of 1 per cent of the average monthly pay received for the preceding 10 years, multiplied by the number of years in the company's service. The pensions are granted also to men permanently incapacitated while in the company's service without regard to age. (See ANNUITIES; PAUPERISM). Consult Squier, L. W., 'Old Age Dependency in the United States' (New York 1912); and annual reports of the Bureau of Labor and of the Commissioner of Pensions.

PENTACLE. See PENTAGERON.

PENTACRINUS. See CRINOID.

PENTATEUCH, pĕn'tă-tūk'. The Hebrew Old Testament consists of three parts, *Law, Prophets* and *Writings*. The first of these, containing five books sometimes called the *Five Books of Moses*, is called *Tōrāh* or *Law*, because it embodies practically the entire legal system of the Hebrews. The five-fold division goes back to very early times, for the early rabbis speak of the *five fifths of the Law*, while the Early Church fathers, beginning with Tertullian, employ the term *Pentateuch*, which is still in common use among Christians. *Pentateuchos* means «five-roll,» that is, the five-roll book. Primarily, the word *teuchos* denotes the box or chest in which the roll was kept, but in the course of time it came to be used of the roll itself. The five-fold division coincides with the contents. Genesis clearly forms a book by itself, and so does Deuteronomy; Leviticus has characteristics of its own, which separates it from the books on either side. This leaves Exodus and Numbers, the opening words of the former (Ex. i, 1–7) and the closing words of the latter (Num. xxxvi, 13), showing that each is considered complete in itself. In this article only subjects dealing with the Pentateuch as a whole are considered. See articles GENESIS; EXODUS; LEVITICUS; NUMBERS; DEUTERONOMY.

2. **The Hexateuch.**— Modern scholars add to the first five books the book of Joshua, which results in a six-roll book, or a *Hexateuch*. Joshua is joined to the others because «its contents, and still more, its literary structure, show that it is intimately connected with the Pentateuch and describes the final stage in the history of the *Origines* of the Hebrew nation.» The reason for separating Joshua from the Torah appears to be twofold: (1) Moses could not be connected with the Joshua material as its author, and (2) the contents prevented its setting apart with the books of the Pentateuch as an authoritative guide of life. (Much of what is said in this article, though referring primarily to the Pentateuch, applies also to the Hexateuch).

3. **General Contents.**— Though there is great variety of contents, all the material may be arranged under two heads: (1) *History*: The historical portions of the Hexateuch cover the period beginning with the creation of the world and ending with the settlement of the Israelite tribes in Canaan. This period may be divided into three epochs: (a) The beginning of all things (Gen. i, 1–xi, 9); (b) The Hebrew Patriarchs (Gen. xi, 10–l, 26); (c) The organization of Israel into a more or less compact national unit and its settlement in Canaan (the historical sections of Exodus, Leviticus, Numbers, Deuteronomy and Joshua). No attempt is made to furnish a complete history, for many important details are treated very briefly or passed over entirely; nevertheless, the stream of narrative is never wholly interrupted, and though at times it is almost lost sight of, it always reappears and flows on to the end. (2) *Law*: The legal sections of the Pentateuch are so extensive that, as has been stated, the whole group is known as the *Tōrāh*, which means law. The book of Leviticus consists entirely of legal material; two others, Exodus and Numbers, are a mixture of law and history; Deuteronomy is made up largely of addresses embodying laws; and even Genesis, which is almost entirely narrative, mentions the laws of marriage and of the Sabbath as given in primæval times, introduces regulations concerning food said to have been given in the days of Noah, and relates the institution of circumcision in the days of Abraham.

4. **History of the Pentateuchal Criticism.** — In the latest portions of the Old Testament it seems to be assumed that the *Law* or *Tōrāh* is the work of Moses (2 Chron. xxxiv, 14; Ezra iii, 2; vii, 6) but it may well be that these passages refer only to the legal system of the Hebrews embodied in the Pentateuch, and not to the book as a whole. However, whatever the significance of these Old Testament references may be, Philo of Alexandria (*Vita Mosis*, iii, 39) and Josephus (*Contra Ap.*, i, 18; *Ant.* iv, 8–48) proceed on the assumption that Moses wrote the entire Pentateuch and the same seems to be true of some of the New Testament writers. The Babylonian Talmud (*Baba bathra*, 14b) states definitely: «Moses wrote his own book, the section about Balaam and Job.» Only the last eight verses of Deuteronomy are ascribed to Joshua, on the reasonable assumption that Moses could hardly have written in his lifetime an account of his own death in the words: «And he died there» (Deut. xxxiv, 5). Nevertheless, according to the Gemara exposition of this passage at least one rabbi insisted that even the closing verses were written by Moses «with weeping.»

The view that Moses wrote the entire Pentateuch maintained itself without very serious opposition until the time of the Reformation. The objectors were few, and they exerted little influence (for instance, Isaac ben Jason in the 10th or 11th century, and Ibn Ezra in the 12th). The Renaissance and the Reformation mark a new epoch in Biblical criticism; and some of the men prominent in the Reformation movement, like Karlstadt and Luther, anticipated some of the conclusions of modern scholars. The learned Catholic Masius also suggested that the Pentateuch may have received its final form from Ezra or some other man of God.

The general church, both Protestant and Catholic, did not adopt the liberal attitude of these leaders, but continued to regard belief in the Mosaic authorship of the Pentateuch an essential article of faith. But there continued to be protests against this view. Among the objectors the outstanding men were Spinoza, Hobbes, Peynerius, Simon, Clericus; but they were vigorously opposed by numerous representatives of the Church. The permanent value of the discussions published during the 17th and the early years of the 18th century lies not in the theories proposed but in their insistence upon the facts and the demand for an adequate explanation of the facts.

Jean Astruc, physician of Louis XIV, and professor of medicine in Paris, gave new direction to critical theories ('Conjectures sur les mémoires originau x dont il paroit que Moyse s'est servi pour composer le livre de la Genèse,' Brussels 1753). Following out suggestions made by earlier writers Astruc maintained that in the composition of Genesis, Moses used several sources which he incorporated in his work practically without alterations. Noticing further that in some sections of Genesis the divine name *Elohim* was used, and in others *Yahweh* he proceeded, on the basis of this peculiarity, to analyze the book into two principal sources, the Elohistic and the Yahwistic or Jehovistic — admitting, however, the presence of 9 or 10 additional minor sources, of which only fragments were preserved. Astruc did not deny the Mosaic authorship of Genesis or of the rest of the Pentateuch; his view was that Moses compiled Genesis from the older sources, and then wrote the remaining four books.

During the latter part of the 18th and during the 19th century Eichhorn, Ilgen, De Wette, Bleek, Ewald, Hupfeld, Graf, Kuenen, Wellhausen and others labored diligently on the problem, until Pentateuchal criticism became established upon a firm, scientific basis. In the course of these investigations various theories have been proposed to account for the complicated facts discovered in the Pentateuch: (1) *The Fragment Theory,* which regarded the Pentateuch as «an agglomeration of longer and shorter fragments, between which no threads of continuous connection could be traced.» The arguments in support of the theory were drawn chiefly from the middle books of the Pentateuch, where the transitions are frequently very abrupt. (2) *The Supplement Theory,* originated in the better appreciation of the common plan and purpose running throughout the Pentateuch. According to that theory in its simplest form, the Elohistic part was the oldest portion and served as groundwork for the whole. It was revised by a later editor, the Yahwist or Jehovist, who annotated the older work throughout and added to it a considerable number of new and independent sections. Deuteronomy was thought to be the latest addition. (3) *The Document Theory.* The discovery by Hupfeld in 1853 of a second Elohim source necessitated a modification of the Supplement Theory. Moreover, a closer study of the interrelation of the different layers in the Pentateuch showed that theory to be inadequate. Its place was taken by what is generally known as the Document Theory, because it considers the Pentateuch in its present form to be the result of the compilation of material coming from at least four documents, each of which is thought to have had originally an independent existence. The earlier advocates of the Document Theory used a variety of symbols to designate the different sources, but at present the four documents are generally known as J — the Jehovistic document, that is, the document characterized by the use of the divine name «Jehovah» or «Yahweh» in the sections narrating events preceding the call of Moses; E — the Elohistic document, that is, the document using the divine name «Elohim» in the corresponding sections; D — the Deuteronomic Code, furnishing the heart of the book of Deuteronomy; P — the Priestly Code, a document combining history and law, written from a distinctively priestly standpoint. All four documents are thought to embody older sources which had an independent existence either in written or oral form.

The Document Theory is the prevailing theory at the present time; but in the course of its history it has passed through various modifications. The form in which it is most widely accepted among scholars to-day is known as the *Graf-Wellhausen Theory,* or the *Development Theory.* The earliest exponent of this view was E. Reuss, who as early as 1833 or 1834, in his lectures at the University of Strassburg, called attention to the fact that the history of Israel as outlined in Judges, Samuel and Kings contained much that seemed to conflict with the theory that the laws of the Pentateuch were in force among the people during the centuries described in those books. He further maintained that the Pentateuchal legal system was utterly unknown to the prophets of the 8th and 7th centuries, that Jeremiah was the first prophet who shows acquaintance with a written law and that his quotations are exclusively from Deuteronomy. This book, or at least its central portion (iv, 45–xxviii, 68), he thought to have been the book found in the temple in the days of Josiah, and he looked upon that code as the most ancient part of the codified legislation contained in the Pentateuch. Ezekiel he believed to have lived prior to the redaction of the ritual code and of the laws which were formulated by the hierarchy. The views of Reuss were not published until 1879. Meanwhile a former pupil of Reuss, K. H. Graf, had published similar views, which were further developed by A. Kayser, A. Kuenen and most brilliantly of all, by Julius Wellhausen. According to these scholars the four documents originated in the order J, E, D, P and their dates, not counting later additions, were approximately: J, 850; E, 750; D, 650; P, 500–450. It should be noted, however, that there are a few scholars (Koenig, Sellin, etc.), who, while accepting the Document Theory in some form, assign the documents to earlier dates, and a few who consider E earlier than J.

The efforts to determine the dates of the completed documents were followed by attempts to fix the age of the material embodied in these documents. The earlier adherents of the Graf-Wellhausen School were inclined to assign not only the completed documents, but practically all the material embodied in them to relatively late dates. Later investigations have clearly shown that much of the material, both historical and legal, must have been handed down, orally or in written form, from very early times.

It would be erroneous to think that no voices were raised against the modern views in general, and against the prevailing Document Theory in particular. Hengstenberg, Haevernick, Keil, Green and others did their best to uphold or re-establish the traditional views. Others, while admitting some truth in the newer views, proposed rival theories which, their authors believed, would explain all the facts without departing so far from traditional views. To this latter group belong A. Klostermann, James Orr, B. D. Erdmans, J. Dahse, A. Troelstra, H. M. Wiener and others. In general it may be said that these more recent theories are a combination of the Supplement Theory and a modified Document Theory. Unfortunately, the textual-critical foundations so necessary for the newer views are rather insecure. Consequently, though it may be admitted that many questions of Pentateuchal criticism are still unsettled and that some of the opinions now held may have to be modified, the Document Theory as presented in its main outlines by the Graf-Wellhausen School has still the better of the argument.

5. Mosaic Authorship.— The arguments in favor of the Mosaic authorship of the Pentateuch or Hexateuch have been skilfully wrought out by those who still favor the traditional view. (For a detailed discussion, consult F. C. Eiselen — 'The Books of the Pentateuch,' chapters IV–VII). But the most that the facts presented by the defenders of the traditional view prove is that the Pentateuch contains elements going back to Mosaic times; which is far different from saying that the entire Pentateuch, with the exception of a few later interpolations or additions, was written by Moses. They cannot even prove that these Mosaic elements were preserved in writing; oral tradition, faithfully preserved, would satisfy all the facts in the case. Nor is it possible to point out any of the Mosaic elements, for they may have undergone alterations, either accidentally in the course of oral transmission, or intentionally, at the hands of later editors or revisers. Putting the case briefly, the facts presented may be said to warrant the following conclusion and nothing more: Whatever the time of the final composition or compilation of the Pentateuch, it contains elements, both historical and legal, that may have originated in the days of Moses. These elements were later modified and expanded in the spirit of the first great leader, and the result of this development, continuing throughout several centuries, is embodied in the Pentateuch in its present form.

6. The Pentateuch a Compilation.— The modern view of the origin of the Pentateuch insists that the Pentateuch is a relatively late compilation of material taken from at least four distinct written sources, J, E, D, P, all of which reached their final form subsequently to the time of Moses. In support of this theory attention is called to facts like these: (1) The peculiar use in the book of Genesis of the divine names *Yahweh* and *Elohim*. There are large sections of Genesis and of the opening chapters of Exodus which systematically use the divine name Yahweh, while others use Elohim (For instance in Gen. i, 1–ii, 4a, the account of creation, Elohim is used 35 times and Yahweh not at all, while in ii, 4b–25, also dealing with creation, Yahweh-Elohim is used exclusively; in Gen. xii–xvi, Yahweh is used 27 times and Elohim not at all; in Gen. xxxiii–l, Yahweh occurs but once, El or Elohim, 67 times). Various explanations of the peculiarity have been attempted, but it receives a natural and satisfactory explanation only on the assumption that the sections were taken from productions of at least two different authors, one believing that the name Yahweh was known from the beginning, the other that it was revealed to Moses (Exod. iii, 13–16; vi, 2, 3; for a detailed discussion consult Eiselen, F. C., 'Books of the Pentateuch,' chap. VIII).

(2) The presence of repetitions and discrepancies, both in the historical and the legal portions of the Pentateuch, supports the theory of compilation. In the narrative sections these repetitions and discrepancies appear sometimes in narratives appearing side by side (compare, for instance, the stories of creation in Gen. i, 1–ii, 4a and ii, 4b–25), sometimes in narratives which, on first sight, appear to be continuous accounts of a single incident (for instance, the story of the flood in Gen. vi–ix), at other times in narratives found in different parts of the Pentateuch (compare, for instance, the duplicate accounts of the origin of names like Beer-Sheeba, Gen. xxi, 31 and xxvi, 32, 33; Bethel, xxviii, 18, 19 and xxxv, 15, or Israel, xxxii, 28 and xxxv, 10, etc). Similar repetitions and discrepancies are found in the legal sections. Mention may be made of the several laws regarding the place of sacrifice (compare Exod. xx, 24, 25 with Deut. xii, 2–7 with Exod. xxvii, 1ff), the laws regarding the priesthood (for instance, compare Deut. xvii, 9, 18; xviii, 1; xxi, 5, with Exod. xxviii, 1; Num. iii, 5–10 and xviii, 1–7) and the laws regarding slavery (compare Exod. xxi, 2–6 with Deut. xv, 12–17, with Lev. xxv, 39–42).

(3) The differences in theological conception, in style and vocabulary, serve as additional supports of the compilation theory. One need not go beyond the stories of creation to discover these differences (compare Gen. i, 1–ii, 4a and ii, 4b–25); but when we remember that the differences are equally marked in other parts of the Pentateuch, the strength of the cumulative argument can hardly be overestimated.

7. Characteristics of the Documents.— Some of the outstanding peculiarities of each of the four documents may be noted:

(1) *Peculiarities of Style.*— The stylistic differences between J and E are not as great as those between JE on the one hand and D or P on the other; which is due to the fact that J and E come from approximately the same age, the creative age, of prophetic narration. However, a few differences between J and E may be noted: J is the best narrator in the Bible. "His touch," says Driver, "is singularly light. With a few strokes he paints a scene which before he has finished is impressed indelibly upon the reader's memory." E is perhaps a little more terse in style, but his narratives are on the whole so well told that it is not easy to see wherein they fall short of J, except that at times they lack the spontaneous charm and strength of the other. P is stereotyped, measured and prosaic. The author shows a preference for standing formulæ and expressions. D can be compared only with the legal sections of P. While P is cold, legal, formal and precise, D is rhetorical and hortatory. In style the latter closely resembles the great prophets.

(2) *Peculiarities of Language.*— All that may be done here is to enumerate a few of the characteristic expressions of each document. The following words are characteristic of J:— "*Yahweh* is the name of the God of Israel even in pre-Mosaic times; *Sinai*, not Horeb, is the name of the mountain on which the law was given; *Israel*, not Jacob, is the name of the third patriarch from the birth of Benjamin on. The inhabitants of Palestine are called *Canaanites;* the regular name of Mesopotamia is *Aram Naharaim; Egypt* is used as equivalent to Egyptian. The longer form of the pronoun of the first person *anokhi* is used, not *ani*. Characteristic phrases are: *To find favor or grace in the sight of* . . .; *to call on the name of* . . . ; *to run to meet* . . .; *took him a wife* . . .; *to preserve seed alive* . . .; *to dwell in the midst of* . . .; the particle *na* with the imperative, etc.

As characteristic of E may be noted: The use of the divine name *Elohim* in Genesis; the pre-Israelitish inhabitants of Palestine are called *Amorites*, not Canaanites; the mountain of God is called *Horeb*, not Sinai; from Gen. xxxii, 32 on *Jacob* is used in preference to Israel; the name of Moses's father-in-law is *Jethro*. Characteristic expressions are also: *the man Moses*, and *to bring up* from the land of Egypt, where J uses *to bring out*.

The linguistic peculiarities of P are very numerous. Driver enumerates 50 expressions characteristic of the narrative portions of

P, many of which occur never or rarely in other books, some of them only again in Ezekiel. Of these may be mentioned: The use of the divine name *Elohim* in Genesis; *Paddan Aram* is the regular name for Mesopotamia; the mountain of God is called *Sinai*, as in J, never Horeb. The shorter form of the pronoun of the first person singular *ani* is used 130 times, the longer form *anokhi* only once. The Hebrew *ammim*, meaning *peoples*, is used in the sense of *kinsfolk*, especially in the two phrases «that soul shall be cut off from his kinsfolk» and «to be gathered unto one's kinsfolk.» Other peculiar expressions are: *To be fruitful and multiply* . . .; *this selfsame day* (literally «the bone of this day») . . .; *after their families* . . .; *soul* (nephesh) in the sense of «person» . . .; *throughout their generations* . . .; *congregation of the Israelites* . . .; *according to the mouth* (*command*) *of* . . .; etc.

D also has its characteristic words and phrases: *Horeb* is used, not Sinai, as the name of the mountain on which the law was given; *that your days may be long* . . .; *a mighty hand and a stretched out arm* . . .; *the stranger, the fatherless, and the widow* . . .; *and remember that thou wast a bondman in Egypt* . . .; *to do what is right* (*or evil*) *in the eyes of Yahweh* . . .; *with all the heart and with all the soul* . . .; *to observe to do* . . .; etc.

(3) *Peculiarities of Thought.*— J reflects a very primitive and pronounced anthropomorphic conception of deity. Yahweh is represented not only as forming human resolutions and as swayed by human emotions which is common also in later books, but as performing his acts in a human way. The J narrative shows less tendency than is seen in other parts of the Pentateuch to explain significant events by an appeal to the extraordinary, miraculous or supernatural. There is a more general recognition of the play of natural forces. (See, for example, the J story of the plagues of Egypt. Exod. viii, 1–4, 20–32; ix, 1–7, etc., and compare these with viii, 5–7; ix, 8–12, etc., and also the J story of the crossing of the Red Sea, Exod. xiv, 21). E reveals different and more elaborate theological ideas. The God of E appears not in bodily form but in dreams and he carries out his plans through the ministry of angels. Closely connected with this high view of Divine manifestations is the representation of Abraham as a prophet and Moses, though not called a prophet, is represented as entrusted with a prophet's mission. Both J and E have much to say about the sacred sites of Palestine. The theological conceptions of P are strikingly different. The author scrupulously avoids anthropomorphisms and there are no angels or dreams as means of communication. In the legal sections of P religion is defined in terms of ritual and form which is at variance with the spirit of J and E.

D, like the other documents, has its own peculiar theological conceptions. Its fundamental theological thought is expressed in Deut. vi, 4. and its fundamental law, reiterated again and again, in Deut. vi, 5. While J and E make mention of the old sacred places D will have nothing to do with them. While J and E seem to consider the pillar a perfectly legitimate symbol of Hebrew religion, D prohibits the setting up of the pillar. While J and E permit the bringing of sacrifice in different places, D recognizes but one legitimate place of public worship.

These and other peculiarities clearly and convincingly point to diversity of authorship.

8. **Post-Mosaic Elements.**— If only the book of Genesis were a compilation Moses might, perhaps, be regarded as its compiler and the author of the remaining books (this was the view of Astruc). But if the entire Pentateuch is a compilation, this fact in itself makes belief in the Mosaic authorship practically impossible. There are, however, some additional specific considerations that have convinced scholars that Moses cannot be the author and that at least some portions come from post-Mosaic times. There are, for instance, certain literary considerations, such as the use of the third person, when speaking of Moses (Num. xxxiii, 2 or Exod. vi, 26, 27), or the account of Moses' death (Deut. xxxiv, 1–8). Again in the narrative portions (Deut. i, 5; iv, 41, 46, 47, 49, Num. xxii) the territory east of the Jordan is spoken of as «beyond Jordan,» implying that the author lived west of the Jordan, which is not true of Moses. Residence in western Palestine is implied also in the use of the geographical term *neghebh*, i.e., the southern portion of Judah with the general meaning «south,» and of «sea,» with the general meaning «west.» The name Hebron, used in Gen. xiii, 18; xxiii, 2; xxxvii, 14, and Num. xiii, 22, was of post-Mosaic origin (Josh. xiv, 15; xv, 13); the same is true of the name Dan (cp. Gen. xiv, 14; Deut. xxxiv, with Jdg. xviii, 29). In the same direction point passages like Deut. iii, 14 (cp. Jdg. x, 3, 4) and Gen. xl, 15.

There are also certain historical statements which point to a post-Mosaic date. Thus Gen. xxxvi, 31 presupposes the establishment of the monarchy in Israel; the expression, «the Canaanite was then in the land» (Gen. xii, 6; xiii, 7), has meaning only if written at a time when the Canaanites had disappeared at least as an independent people. Deut. ii, 12 and Num. xxi, 14, 15 look back to the conquest as an accomplished fact. Exod. xv, 13, 17, presuppose the establishment of Yahweh's sanctuary on Mount Zion. If Moses wrote the entire Pentateuch, is it not strange that he was in doubt regarding the name of his own father-in-law (cp. Exod. ii, 18; Num. x, 29, with Exod. iii, 1; xviii, 1). Moreover, the characterization of Moses in certain passages reads as if it came from some one other than Moses (for example, Exod. xi, 3; Num. xii, 3; Deut. xxxiv, 10). There are also some legislative enactments which presuppose a background other than that of the desert (for instance, Exod. xxiii, 19; Deut. xix, 14), and some archæological references which seem to have originated at a relatively late date (for instance, Exod. xxx, 13, 34; xxxviii, 24–26; and Deut. iii, 11).

Now, while it is true that Moses might, perhaps, have written some of the passages enumerated, others cannot possibly come from him; and in every case the only natural interpretation is that which ascribes the passage to another and later author. Again, while some of the passages might, perhaps, be thrown out as interpolations, others are so closely bound up with their context that they would carry with them large sections of the Pentateuch, and the resulting breaking up of continuity in narration would increase rather than diminish the difficulties. On the other hand, all the difficulties disappear if it is admitted that the narrative in which the alleged post-Mosaic elements are found were written in the period to which modern scholarship assigns them.

9. Chronological Order of the Pentateuchal Documents.— If the Pentateuch is a compilation, and if the documents used by the compiler were written subsequently to Moses, is it possible to arrange them in chronological order? In an attempt to solve the problem scholars have studied the documents along several lines, so as to determine: (1) The historical situation reflected in the documents; (2) the theological standpoint expressed or implied; (3) the relation of the Pentateuchal documents to other Old Testament writings; (4) peculiarities of vocabulary and style, and (5) the mutual relation of the documents. The conclusions reached may be summed up in these words: 1. J and E reflect the historical situation of the period of the judges and of the early kings; D that of the later kings, especially conditions presupposed in the account of Josiah's reforms and Jeremiah's prophecies; P that of the exilic and postexilic period, especially the age of Ezra-Nehemiah. 2. The theological standpoint of each document agrees with what is known of Hebrew theological thinking during the period to which the document is assigned by the historical background reflected in it. 3. J and E have points of contact with Old Testament writings known to have originated before B.C. 650 (for instance, the 8th century prophets); D with literature that can be dated between 650 and the exile (Jer., Kings); P with that of the exilic and postexilic period (Malachi, Ezra, Neh., Chronicles). D appears to have been unknown during the period of the early monarchy, P before the exile. 4. The vocabulary and style of each document are just what they might be expected to be if the documents were written during the periods to which the historical background points. 5. In their legal as in their historical sections JE, D and P represent three successive stages of development; P implies the prior existence of D, D the prior existence of J and E. 6. All the available evidence points to the following approximate dates for the documents: J belongs to the early centuries of the monarchy, perhaps to the 9th century; E was written somewhat later, but still during the period of the early monarchy, perhaps a generation or two preceding the appearance of the 8th century prophets. D presupposes the activity of the 8th century prophets and was written during the reactionary reign of Manasseh, not far from 650 B.C. (See DEUTERONOMY). P originated among the descendants of the exiles in Babylonia about 500 or 450 B.C.

10. Growth of the Pentateuch.— In conclusion, a brief survey may be given of the several stages in the development of the Pentateuch.

(1) The earliest literary period in Israel, as among other peoples, was preceded by an age of song and story. The songs, dealing with significant incidents and events in the history of the clan, tribe or nation, and with the heroic deeds of individuals, were highly prized and repeated both by the common people and by professional singers. Alongside of these songs existed stories and legends centring around important persons and events. Some of this material goes back to pre-Mosaic times.

(2) In the course of time collections of the songs were made, two of which are referred to in the Old Testament (The Book of the Wars of Yahweh, Num. xxi, 14 and The Book of Yashar, Josh. x, 13).. Similarly, the individual stories were combined into cycles, centring around prominent persons who distinguished themselves in battle or in connection with other epoch-making events (cp. The Patriarchal Stories).

(3) After the occupation of Palestine the Hebrews assimilated in large part the native population and rededicated to Yahweh many of the local shrines and sanctuaries. With the sanctuaries some of the traditions that had grown up around the sacred places were taken over by the invaders.

(4) In time the new religion introduced by Moses permeated the early pre-Mosaic material and caused various other modifications that brought them into line with the newer and higher religious conceptions.

(5) The entrance into Palestine produced far-reaching social changes which necessitated the adaptation of older laws to the new conditions and to the formulation of new laws. At the sanctuaries, codes of such laws may have been made (cp. The Book of the Covenant), and in the same places efforts may have been made to preserve in more permanent form the songs and stories of the past.

(6) During the period of the United Monarchy traces of connected prose writing appear for the first time. The new literary interest continued to flourish, even after the division of the kingdom, and manifested itself among the prophets in the collection of ancient songs and stories, and their compilation, after impressing upon them the religious ideas of the collectors into extensive narrative works, which endeavored to trace history back to the beginning of man's life upon earth. Several compilations of this kind may have been undertaken, but only two of them, «The Yahwist,» written in Judah, and «The Elohist,» written in Israel, exerted marked influence on later literary developments affecting the growth of the Pentateuch.

(7) The next significant step was a combination of these two documents, «The Yahwistic» and «The Elohistic,» into one continuous history. This was done probably during the reactionary reign of Manasseh, when the lessons taught in and by these histories needed to be impressed upon the people. As might be expected, the Yahwist, which originated in Judah, where the combination was made — the northern kingdom having disappeared — was made the basis of the compilation.

(8) During the same general period the Deuteronomic Code, or D, assumed literary form. In a sense D marks a compromise between the prophets and the priests. The author or authors sought to make the prophetic teaching more effective by putting the lofty, prophetic principles into concrete form. Hence,

they adopted, as far as possible, previously existing forms, usages and traditions, and eliminating the lower elements they poured into them a deeper and more spiritual significance.

(9) After the acceptance of D as the law of the land during the reign of Josiah, the desirability of combining the new law code with the earlier documents was soon felt. This feeling received a new impetus after the dissolution of the national life, when the few remains of national literature came to be highly prized. Thus, at some time during the 6th century D was united with JE, the compiler, or compilers, introducing into the older work such modifications as were necessary to maintain or establish a logical arrangement.

(10) The publication of D with its prophetic note caused the priests to feel that their own interests and the interests of the phase of religion they represented demanded the collection into a short code of the more fundamental laws dealing with the priests' interests and ideals. The result was the so-called «Law of Holiness» (Levit. xvii–xxvi. See article LEVITICUS), which was compiled shortly before the exile of B.C. 586.

(11) The Babylonian exile was of the greatest significance in the development of Israel's literature and religion. Religion became spiritualized, especially through the activity of Jeremiah and Ezekiel. But while the spiritualizing process was going on the question seems to have arisen in the minds of some: Having reached the higher stages of religion, how may the lapses of the past be avoided? The answer was: By insisting upon obedience to definite rules and regulations. With the promulgation of D the reign of written law had its beginning; the Law of Holiness and the laws of Ezekiel mark further steps in the same direction, but the highest development of the legalistic tendency may be seen in the Priestly Code, which originated among the exiles in Babylon.

(12) The new law, having behind it the authority of the name of Moses, soon came to be accepted and revered as final authority. In other words, the seat of authority was transferred from the present experience of communion with God to laws thought to have been given when God seemed much nearer to his people. This new interest in the past impelled some priest or priests who were under the influence of the new point of view to rewrite the early history of Israel, tracing it back to creation, perhaps for the sole purpose of providing a fitting historical setting for the laws of the Priestly Code.

(13) The necessity of amalgamating the two parallel histories of the Mosaic and the pre-Mosaic ages JED and P must have been felt soon after the compilation of the Priestly Code. As long as the two existed side by side as separate works, they would appear to compete for recognition as the authoritative work of Moses or of Yahweh. Such controversy could be avoided only by uniting the two into one continuous work. The task of fusing JED with P may have been undertaken by Ezra the scribe, or, if not by him, by some one else who was in hearty sympathy with the ideals of P.

(14) Thus, aside from minor alterations made at a later period, the Pentateuch reached its complete form before B.C. 400. The finished production received the designation *Tōrāh* or *Law*. Subsequently it was divided at natural dividing points into five parts or books, so that the whole came to be known as the «Five-Fifths of the Law.» From this title came the name «Pentateuch,» meaning «Five-Roll Treatise,» which was coined by Greek writers, from whom it passed into Latin and other Western languages.

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PENTAUR (Egyptian, *Pen-ta-were*), an Egyptian scribe who died about the 10th year of the reign of Menephtah. He is famed as the copyist of the papyrus (Sallier 3) in which is recorded the poem celebrating the victory of Rameses II over the Hittites at Kadesh. Pentaur was long considered the author of the poem. In Egypt another person of this name was tried and convicted of treason in the reign of Rameses III. Consult Breasted, J. H., ‹A History of the Ancient Egyptians› (New York 1908).

PENTECOST, George Frederick, American Presbyterian clergyman: b. Albion, Ill., 23 Sept. 1841. He was private secretary to the governor of Kansas Territory in 1858 and later entered Georgetown University which he left to join the Union army, where he was chaplain of the 8th Kentucky Cavalry volunteers in 1862–64. After the war he held several Baptist pastorates, was pastor of Tompkins Avenue Congregational Church in Brooklyn 1880–87; engaged in evangelical work with Moody in Scotland and England in 1887–88; and in 1889–91 conducted a mission to the English-speaking Brahmans in India. He was pastor of Marylebone Presbyterian Church, London, 1891–97, and of the First Presbyterian Church, Yonkers, N. Y., 1897–1902; and after that was sent by the joint boards of the Presbyterian and Congregational churches as special commissioner to the Philippine Islands, China and Japan. He is at present the pastor of the Bethany Presbyterian Church in Philadelphia. He has written 'The Angel in the Marble' (1876); 'Bible Studies' (10 vols., 1880–89); 'Birth and Boyhood of Christ' (1896); 'Precious Truths' (1898), and others.

PENTECOST (from the Greek *pentekoste*, the fiftieth), a Jewish festival, held on the fiftieth day after Passover (the 16th of Nisan), in celebration of the ingathering and in thanksgiving for the harvest. It may fall on the 5th, 6th or 7th of Sivan. Its establishment is related in Levit. xxiii, 15, 16 and Deut. xvi, 9–12. It was called the Feast of Weeks (Exod. xxxiv, 22) because it occurred at the end of a week of weeks, or seven weeks; the Feast of the Harvest (Exod. xxiii, 16); or the Day of First-Fruits Numb. xxviii, 26). It is celebrated by Jews of the present day on the 6th and 7th of Sivan — that is, between the second half of May and the first half of June. It is also a festival of the Christian Church, occurring 50 days afer Easter, and is celebrated in commemoration of the descent of the Holy Ghost upon the disciples gathered together to celebrate the ancient feast (Acts ii, 1–4). It is called Pentecost in the Roman Catholic Church; but Whitsunday by Anglicans.

PENTECOSTAL CHURCH OF THE NAZARENE, also called the **HOLINESS CHURCH**, an American church body formed in 1908. Its most particular tenet is sanctification by faith after justification has been effected through the medium of divine grace. The Church maintains a collegiate institute at North Scituate, R. I., and maintains theological schools at Los Angeles, Cal., and at Pilot Point, Tex. It is also connected with Texas Holiness University at Peniel, Tex., and Arkansas Holiness University at Vilonia, Ark. The official publications are the *Beulah Christian*, Providence, R. I., *Holiness Evangel*, Pilot Point, Tex., and *The Nazarene Messenger*, Los Angeles, Cal. In 1919 the Church had 780 ministers, 941 churches and 33,419 communicants.

PENTELICON, the modern mountain range known as Mendeli. It is situated in Attica. The marble quarries on its slopes furnished material for the great public buildings of Athens. Consult Gardner, E. A., 'Ancient Athens' (London 1902).

PENTHESILEA, according to Greek legend the daughter of Ares and queen of the Amazons. She aided the Trojans in their struggle with Greece and was slain by Achilles, who was about to erect a tomb for her when Thersites reproached him so that Achilles slew the latter and the body of Penthesilea was thrown into the Scamander by Diomedes.

PENTLAND FIRTH, pĕnt'lạnd fėrth, a channel connecting the Atlantic Ocean with the North Sea, lying between the mainland of Scotland and the Orkney Islands. It is about 14 miles long, east to west, six to eight miles broad and is regularly traversed by a steam-ferry. A current, setting from west to east at each tide, flows through it with a velocity of 6 to 12 miles per hour, meeting another tidal wave speeding from east and causing many eddies and whirlpools, rendering navigation exceedingly dangerous for sailing vessels. At its eastern extremity are the Pentland Skerries, a group of small islands and rocks, the scene of numerous shipwrecks. On the Muckle Skerry, about four and a half miles north by east of Duncansbay Head, are twin lighthouses, 100 feet apart, with two fixed lights — the one 170 feet, visible 19 miles, and the other 140 feet high, visible 18 miles. Previous to the war more than 5,000 vessels a year navigated this passage.

PENTLAND HILLS, a mountain range of Scotland, of porphyry and greenstone formation, in the counties of Edinburgh, Peebles and Lanark, commencing three and a half miles south by west of Edinburgh, and extending southwest for about 16 miles. The highest summits are Scald Law, 1,898 feet, and Carnethy, 1,890 feet above sea-level. The water supply of Edinburgh is obtained from springs on these hills.

PENTLANDITE, a sulphide of iron and nickel worked for nickel in Gap mine, Lancaster County, Pa.

PENTONVILLE, London, England, a populous district in the parish of Saint James, Clerkenwell, first settled in 1773. It gives its name to the Pentonville Model Prison, built in 1840–42 in Caledonian road, in the adjacent parish of Islington. The prison is constructed on the radiating principle, so as to admit of thorough inspection, and contains accommodation for 520 prisoners. The treatment is to "enforce strict individual separation, with industrial employment and moral training." The advantages of this type of prison quickly brought it into prominence, and within a very short time a large number of such prisons were erected not only in England, but all over the civilized world.

PENTSTEMON, in systematic botany, a genus of chiefly American perennial herbs of the figwort family (or *Scrophulariaceæ*) having opposite or verticillate leaves and bright blue, purple, red or white flowers. The name of this genus is from two Greek words, *πεντε*, five, and *στήμων*, or warp (the latter word akin to the Latin *stamina*, a warp, a fibre),— two words conjoined, and thus expressing the idea of "five-stamened" plants, a notion that refers to the presence of a fifth stamen in plants of the genus. It is to be noted, however, that the stamen in question, unlike its four companion stamens, is imperfect, having no anther. The vast majority of the many species of this genus are natives of western United States. Two, perhaps three, species occur in the eastern half of the Union; while a few occur wild in Mexico. Many, cultivated under the name "Beard-tongue," are to be found in American gardens. A sterile filament, usually densely bearded, is characteristic of the plant. This perennial has pretty flowers which in the late spring and during the summer abound in dry, rocky regions, giving at a distance a hyacinth-like effect to the landscape. In parts of the United States they are said to be very beautiful, especially somewhat to the southward.

Pentstemon pubécens of Solander is a common species, and its stem is found to range between one and three feet in length. Its leaves are oblong or lance-shaped, and its dull purple or partly whitish, nodding flowers open in a slender cluster. Its calyx is five-parted; its corolla tubular and slightly dilate, the throat being nearly closed by a bearded palate. It has four stamens perfect, and the fifth is a densely yellow-bearded sterile filament; and there is a single pistil. It occurs especially in dry soiled regions. *P. digitalis* of Gray, the white beard-tongue of more western localities and especially of Pennsylvania, is a very effective plant, which at times attains the height of five feet. It is perhaps the tallest member of the genus. An abruptly inflated corolla inclines toward a pure white flower in this species. Other species of the genus are (1) *P. lævigatus* of Solander, growing from two to four feet tall, with a white corolla sometimes purple-tinged; (2) *P. Cobæa* of Nuttall found on the plains from Kansas southward. It grows from one to two feet tall; has ovate, even denticulate leaves, and a few-flowered panicle or raceme, a pale purplish corolla, abruptly inflated above a narrow base. Its sterile filament is bearded. Pentstemon Cobæa is often found cultivated; (3) *P. ovàtus* of Douglas, found in Oregon, is an early blue-flowered species, puberulent or pubescent, with ovate or lance-ovate serrate leaves, and an open panicle of small flowers; (4) *P. confértus* of Douglas, which grows from one to two feet tall, has lance-oblong, oblong, even linear, quite entire leaves. Its inflorescence is spike-like, interrupted and naked. Its corolla is small, cream or sulphur-colored. Yet in one variety of this species, P. caerùleo-purpûreus of Gray, it is blue-purple and violet colored. This variety occurs in the Rocky Mountain area and in other parts of the West; (5) *P. campanulátus*, of Willdenow, is a plant with lanceolate leaves, the base clasping. It flowers in a raceme-like, one-sided panicle. Its corolla is reddish-purple or rose-colored; and its sterile filament is bearded. Common in gardens, this Mexican species varies greatly under cultivation; (6) *P. barbatus* of Nuttal, another species found in Mexico and in the United States as far north as Colorado, has been long under cultivation in gardens. Its slender, wand-like stems attain from three to four feet in height. Its leaves are pale, and it has a long, loose, raceme or panicle of drooping flowers. The corolla is narrowly tubular and of a scarlet hue. Some beard appears in its throat but its sterile filament is naked; (7) *P. grandilflòrus* of Nuttall, is pale and graucus, with thick ovate leaves, closely sessile and entire; the upper ones are rounded. Its short-pediceled flowers are lilac-purple; its oblong, bell-shaped corolla is almost equally five-lobed; and its sterile filament is nearly smooth. Its home is in Wisconsin and to the west and southward of that State; (8) *P. glaber* of Pursh, found on the great plains from Dakota, south and west. Its ascending stems are from one to two feet long. Its leaves are lanceolate or lance-ovate, and it bears a narrow panicle of very handsome flowers; the tubular-inflated corolla being of a bright purple-blue hue, with spreading lobes. Its sterile filaments are found either slightly hairy or else entirely naked; (9) *P. Hartwegi* of Bentham (or *P. gentianoides*), with lanceolate leaves, elongated peduncles, three-flowered and a corolla of a deep red or red-purple, is found wild in Mexico; and has also passed under cultivation.

Plants formerly called Chelone or Turtle-Head (q.v.) (*Chelone barbata* and *Chelone campanulata*) are now classed among pentstemons.

PENUMBRA. See ECLIPSE.

PENZA, pĕn'zä, Russia, (1) the capital of a government of the same name, beautifully situated on an eminence at the junction of the Penza and Sura, 492 miles by rail southeast of Moscow. It is the see of a Greek Catholic bishop. It was founded in 1666 by Michael as one of four fortified defenses against Tartar incursions, and consists of an old town with wooden houses, and a new town with many fine mansions and residences, and handsome churches standing in the centres of large open squares. In the upper end of the town is Cathedral square in which are located the Greek cathedral, the courthouse and the governor's residence. In the town are several beautiful gardens, a large park, and numerous good educational institutions, including a horticultural school connected with the Imperial Botanical Gardens located here. It possesses paper mills, lumber and flour mills, cloth factories, iron works, tanneries, soap-boiling and candle-making establishments, etc. Penza is the market place for certain characteristic textile manufactures of goats' wool, made in the government. Here also are held two fairs in each year for sales of the horses and cattle bred in the neighborhood. Pop. 83,100 (1917). (2) A government of central Russia, bounded north by Nipni-Novgorod, west by Tamboy, south by Saratov, and east by Simbirsk, has an area of 14,997 square miles. Its surface is undulating and intersected by low hills separating the basins of the Oka, Don and Volga, the last of which receives the far largest share of the drainage indirectly. The Moksha and Sura rivers are navigable and support a large and active traffic. The climate is rather severe; the average yearly temperature being 40°, with extremes of 12° in January and 68° in July. The soil is a fertile black loam. The forests are extensive, especially in the north. Agriculture is the chief industry, and the region has large areas devoted to the sugar beet which flourishes here. Cattle and horses are raised in quantity, and much grain is grown. Bee-keeping is widely followed. Mill-stones are quarried. The chief exports are corn, flour, spirits, leather, soap, wax, honey, potash, wool and timber. Manufactures are steadily progressing in the government. Pop. 1,940,500.

PENZANCE, pĕn-zăns', England, a seaport town of Cornwall, picturesquely situated on the northwest margin of Mount's Bay, on a finely curved shore, bordered by rocky heights, 26 miles southwest of Truro. It is the terminus of the Great Western Railway. Besides three fine parish churches, it has various Dissenting chapels, a handsome town-hall, market-house and custom-house; a grammar school, and science and art schools; a geological society with a valuable collection, a public library, and other scientific or literary institutions. The harbor is small, about 25 acres, and is formed by a breakwater, with a lighthouse at the extremity. The climate is extremely mild, though moist, and it is highly esteemed as a health resort. It is a large gardening section raising early vegetables for the London market. The principal industries, however, are fishing and shipping. There is a large export of tin and copper, china-clay, mackerel and pilchards to Italy. The town was burned by a band of Spanish marauders in 1595, and was sacked by Fairfax in 1646. Pop. about 15,000.

PEONS AND PEONAGE. Peon is a Spanish word signifying a day laborer, and in South America is applied especially to Indians. By the word peonage is meant compulsory service based on the indebtedness of the peon to the employer. By the civil law under the Spanish colonial system, and by special statute in some countries, as for instance by the law regulating contracts between masters and servants in Mexico, peons are compelled to continue to work for their employers, if they are in debt to the latter, until the debt is paid. They receive wages, amounting in Mexico to $5 a month. The condition which arises is that no effort is made by the peon to keep out of debt; on the contrary, the larger his debt the more secure he feels, and if the employer insists on scaling down the indebtedness, it is not only regarded as an insulting lack of confidence, but also as notice of a coming discharge. On his side, however, the peon may demand a statement of his account at certain intervals, and be allowed 17 days freedom to look for a new employer willing to buy his account — that is, pay the debt to the former employer, and take over the peon worker and his indebtedness. In Colombia peonage is at its worst. The peon is obliged to work for the employer whom he owes four days in every week. For this service he receives five cents per day if on the uplands, 10 cents if on the lowlands. He has the use of an acre or more of land upon which to raise food for his family, and except for the prescribed four days (eight hours each) his time is his own. As a rule «trading» is done at the store of his employer, and the peon is at his mercy if disposed to demand extortionate prices. It is alleged that many proprietors, by enticing the peons in their employment into needless expenditures, and by selling them goods and advancing them money, contrive to keep them hopelessly in debt and in a consequent state of bondage. The creditor, however, has no power over the wife and children of the peon, nor can the latter be sold like a slave. Peonage was abolished in the Argentine Republic in 1886.

In the United States peonage has always existed to a greater or lesser extent, especially in the Southern States. When Arizona and New Mexico came under the jurisdiction of Congress it was found that the local laws and customs recognized the peonage system, and it continued until 1867, when Congress abolished peonage in the United States and the territories thereof. This condition of qualified servitude is still more or less prevalent in the South, and in some places the brutalities perpetrated have led to the indictment and prosecution of offenders for violations of the statutes. Since 1890 the prosperity of the Southern States has rivaled that of the North, and the demand for labor has been phenomenal, and employers, especially in the naval stores industry and on the plantations, have had great difficulty in securing workmen. As a result of these conditions there has been a great demand for convict labor (q.v.). In many instances persons, white as well as black, apparently without money or friends, have been arrested by the local constable and arraigned before the police or justice of the peace court. At this point it has been customary for an employer or agent of a large employer of labor to appear on the scene and induce the prisoner to plead guilty to a trivial offense, with the understanding that the employer (who is quite often in conspiracy with the court officials) would pay the fine and prevent an imprisonment. A written acknowledgment of debt is secured from the victim, in which he agrees to work for the person paying the fine, either on his plantation or in his labor camp. The victim is then taken to the place of labor, and finds that he is guarded there like a convict. If he turns to and works diligently so as to pay off the debt due his employer, he is charged with all kinds of goods at high prices, and the debt is held over him for an indefinite period. If, on the other hand, he revolts and escapes, he is run down, arrested without process, returned to the private prison and perhaps beaten brutally.

Another way of securing victims is for the employer or his agent to proceed to some town or city and to hire a lot of laborers, agreeing to pay them certain wages and their railroad fare to the place of labor, and to advance them provisions from the company store, or, as it is commonly called, the commissary. The laborers arrive, and at the outset are indebted to the employer, who sees that they trade out their wages at the commissary, and in many instances, by a system of deductions and false entries, manages to keep the laborer perpetually in debt. If the laborer has a family, so much the better for the employer; they must live out of the commissary, and if the laborer runs away his family is detained at the camp. The writer has known of an employer withholding young children from both father and mother for the purpose of forcing the payment of a debt. If the laborer escapes, the machinery of the local criminal law is put in motion to arrest and return him under the charge of false pretenses, cheating and swindling; or, in the State of Florida, under the law relating to false promises. If the runaway is arrested he is seldom tried before the courts. The arresting officer, often in the pay of the employer, induces the victim to return to work rather than go to jail, and so he returns to bondage with a heavier load of debt to carry, for the cost of pursuit and arrest is charged to him. Often no process is issued for arrest, but the employer arrests without process, returns the prisoner to his labor camps and inflicts severe chastisement. Many of the labor contracts contain provisions to the effect that the laborer consents to allow himself to be locked in a stockade at night and at any other time when the employer sees fit to do this.

On 2 March 1908 the House of Representatives passed a resolution requesting the Immigration Commissioner to investigate the treatment and conditions of labor of the immigrants on the cotton plantations of the Mississippi Delta, in Mississippi and Arkansas, and also on the turpentine farms, and in the lumber and railway camps of Florida, Mississippi, Louisiana and other States. The commission made an exhaustive inquiry, and developed the fact that cases of peonage existed in every State in the Union excepting Oklahoma and Connecticut. Most of those in a condition of peonage in the South had been sent there from New York City, their fare thither constituting the first link in the chain of debt which ever grew heavier. It was found that the root of the system was in the terms of the contract-labor laws, which made the flight of a man in debt for money or goods or transportation advanced, *prima facie* evidence of intent to defraud; and thus it was easy to bring about their arrest and sentence to jail, unless the employer paid a fine to be charged up on the peon's account. The courts in Virginia, West Virginia, North Carolina, Georgia, Florida, Alabama, Mississippi, Arkansas and Missouri found methods of safeguarding the rights of the peons, and have done much toward ending the condition; and the Supreme Court in the historic Clyatt case ruled that while there is no law against peonage, it was unlawful to arrest and confine a man for debt, and that damages might be recovered therefor. The condition of peonage is still in uninterrupted sway in some of the New England lumber camps, and to some extent in every cosmopolitan city.

In New York and San Francisco thousands of Chinese coolies, mostly employed in laundries, exist under a system of peonage not unlike that in vogue in the South; while the Italian padrone system, which has always held sway in the Italian quarter of New York City, has held hundreds of immigrants in slavery. These two evils of metropolitan life have received scant if any attention from the Federal, State or municipal authorities.

PEONY, a genus (*Pæonia*) of the family *Ranunculaceæ*. With one exception (*P. brownii*) the species are natives of Europe and Asia. They are practically all in cultivation in gardens, being valued for their hardiness, easy cultivation and large, attractive flowers. They are mostly herbaceous perennials with tuberous rootstocks, large pinnate leaves and flowers ranging through all shades of red to white and yellow. Many garden varieties and hybrids have been produced, including numerous double forms. The plants will grow in almost any soil, but thrive best in rich, rather moist deep loam. The crowns should be buried two inches below the surface and the ground, especially close to the plant, kept free from weeds. When once established annual dressings of stable manure should be given and the plants left undisturbed. Properly treated peonies will often prove satisfactory for 25 years without removal or renewal. The most popular species is *P. officinalis,* a native of southern Europe, which produces large flowers abundantly during late spring. The next most popular is probably *P. albiflora,* a native of Siberia, blossoming about a month later than the preceding species and having fragrant flowers. A large number of the cultivated forms are derived from these two species. The roots of the latter are used by the Tartars for food. Several species are known as Chinese peonies but this term is more widely applied to hybrids and varieties of a more extended list than the native Chinese kinds. They are often fragrant and double-flowered. The tree-peony (*P. moutan*) often grows five feet tall, is much branched, and prolific of bloom. It is somewhat less hardy than the common peony and in the North is often grown as a greenhouse plant. It is a native of China, where it has long been cultivated and where there are hundreds of varieties. In America it is less known than the first two species. When grown out of doors the tree-peonies should be mulched with litter or leaves if in exposed places, especially north of Philadelphia.

PEOPLE'S INSTITUTES. The people's institute purposes to promote broader co-operation between different classes of society, to increase the spirit of tolerance between different religious and racial groups, to create a social consciousness and civic pride. Two significant movements are to be recorded for the last two decades. The People's Institute of New York City was organized in 1897 in Cooper Union; the Rochester Social Center was organized in the autumn of 1907 as part of the extension activities of the Rochester public schools. The undertaking is a large one. Religious predilections are deeply rooted; political theories and party allegiances give rise to intemperate discussions, racial and political customs among immigrants constitute serious social barriers. But to name the difficulties confronting this socializing effort is to emphasize its importance. The plan has commended itself to many communities but few have been able to avoid the pitfalls of politics and prejudice. The people's institute may become the nerve centre of democracy but it must be built on very generous lines.

Activities.— The activities of a people's institute are both intellectual or cultural and social. Anything that promotes sociability and stimulates the intellectual and moral life is a legitimate part of the work. Lectures, concerts, debates, study-groups, folk-dramatics, games, dances — such is the program.

Community interests focus the community attention. Social welfare, civic improvements, public sanitation, are used to awaken a social consciousness and social solidarity is an inevitable consequence as soon as a common interest has been found to intensify and fix community thought. It is reasonable to expect free discussion of political doctrines in a people's institute. But campaign speakers may not be safely included on the program until a community has been educated to a large measure of intellectual self-control. The people's institute is another form of educational extension and should be considered with PARENT-TEACHER ASSOCIATIONS, EDUCATION, IMMIGRANTS, CONTINUATION SCHOOLS, MOTHER'S CLUBS and the LYCEUM MOVEMENT (qq.v.).

A. R. BRUBACHER.

PEOPLE'S PALACE, a building in the East End of London, situated in Mile-end Road, opened by Queen Victoria, May 1887. It provides for the population of the East End a hall for concerts and other entertainments, a library and reading-rooms, gymnasia, swimming-baths, social-meeting rooms, rooms for games, refreshment-rooms, a winter-garden, technical schools, etc. The first year the membership was 4,200. The nucleus of the palace was the Beaumont Philosophical Institute, founded by J. T. B. Beaumont (died 1840), who left $60,000 to establish an institution for the moral and intellectual improvement of the working-class in the East End of London. A movement set on foot by a novel by Sir Walter Besant—'All Sorts and Conditions of Men'—in which a «Palace of Delight» was described, resulted in raising the fund to $375,000, and with this largely increased fund the People's Palace was constructed. It is supported mainly by the annual contribution of $35,000 made by the Drapers Company of London. The technical schools, organized under the title of «The East London Technical College,» now rank as a school of the University of London with the title of «The East London College,» and as such receives a grant of $17,500 annually.

PEOPLE'S PARTY, The, or POPULIST PARTY, an American political party with national and State organizations, originally formed at a national convention held at Cincinnati, Ohio, 19 May 1891. The People's party was the outgrowth of various smaller organizations like the Greenback party, the National Farmers' Alliance, the Grangers and other bodies composed of workingmen and the agricultural classes. It became the third political party in size and strength, next to the Republican and Democratic parties, and for over a decade was an important factor in American politics. The original convention platform demanded:

> The free and unlimited coinage of silver; the abolition of the national banking system; the issue of fiat money in sufficient quantity to transact the business of the country on a cash basis, and the loan of such currency to the people at not more than 2 per cent per annum on non-perishable agricultural products; national ownership of all means of public communication and transportation; a graduated income tax; popular election of United States senators; the adoption of the initiative and referendum in legislation; and the prohibition of alien ownership of land.

In 1892 the second National Convention of the People's party met at Omaha, Neb., on 2 July, to nominate candidates for President and Vice-President, and adopted substantially the same platform as that promulgated at Cincinnati. The nominees were James B. Weaver of Iowa, for President, and James B. Field of Virginia, for Vice-President. At the subsequent election in November the ticket received 22 electoral votes and a popular vote of 1,055,424. In the next Presidential campaign, that of 1896, the party nominated William Jennings Bryan, for President, and Thomas E. Watson of Georgia, for Vice-President. The platform adopted at the National Convention was as follows:

> 1. We demand a National money, safe and sound, issued by the General Government only, without the intervention of banks of issue, to be a full legal tender for all debts, public and private; a just and equitable, and efficient means of distribution, direct to the people, and through the lawful disbursements of the Government.
>
> 2. We demand the free and unrestricted coinage of silver and gold at the present legal ratio of 16 to 1, without waiting for the consent of foreign nations.
>
> 3. We demand that the volume of circulating medium be speedily increased to an amount sufficient to meet the demands of the business and population, and to restore the just level of prices of labor and production.
>
> 4. We denounce the sale of bonds and the increase of the public interest-bearing debt made by the present Administration as unnecessary and without authority of law, and demand that no more bonds be issued, except by specific act of Congress.
>
> 5. We demand such legislation as will prevent the demonetisation of the lawful money of the United States by private contract.
>
> 6. We demand that the Government, in payment of its obligations, shall use its option as to the kind of lawful money in which they are to be paid, and we denounce the present and preceding Administrations for surrendering this option to the holders of Government obligations.
>
> 7. We demand a graduated income tax, to the end that aggregated wealth shall bear its just proportion of taxation and we regard the recent decision of the Supreme Court relative to the income tax law as a misinterpretation of the Constitution and an invasion of the rightful powers of Congress over the subject of taxation.

In this campaign of 1896 Bryan also received the nomination of the Democratic party, and a majority of the People's party also voted for the Democratic Vice-Presidential candidate, W. J. Sewall of Maine. Those who remained steadfast to the Bryan and Watson ticket were popularly known as «Middle-of-the-Road Populists.» Bryan received 176 electoral votes, Sewall 149 and Watson 17. Various State conventions of the People's party in 1898 adopted substantially the same declarations of principles, the salient points of which were: The free and unrestricted coinage of silver and gold at the ratio of 16 to 1, without waiting for the consent of other nations; the speedy increase of the circulating medium to an amount sufficient to meet the demands of a growing business, and no further issue of United States interest-bearing bonds. Other demands of these conventions were for postal savings banks, the government ownership of railroads, telegraph, telephones and lighting plants; the construction and ownership of the Nicaragua Canal by the United States; the election of United States senators by the direct vote of the people and the adoption of the initiative and referendum. «Government by injunction» was denounced; also all funding bills calculated to extend the time for the payment of the Pacific Railroad debt. All conventions commended the action of the United States in making war upon Spain and promised the support of their party to the government in its efforts to carry it to a successful issue. The North Carolina convention opposed «the domination of gold and monopoly» and favored the «overthrow of national banks and railroad influence in controlling legislation.» The Nebraska convention demanded «more money and less misery for the people» and protested against the retirement of the greenback.

At the close of the campaign of 1896 much opposition arose among Southern Populists against a further alliance with the Democratic party and spread northward. On 14 Feb. 1897 the first open rupture occurred at Grand Rapids, Mich., in a State convention, and resulted in two State organizations. On 22 Feb. 1897, at a meeting of the Populist Reform Press Association at Memphis, Tenn., a committee was appointed to endeavor to heal the differences, and call a conference, if deemed necessary. The Nashville Conference, held 3, 4 and 5 July 1897, was the outcome, but turned out to be a mid-road convention. A National Organization Committee, similar to the National Committee, was appointed with power to call a National Convention if deemed necessary. This committee called a convention, which was lightly attended, at Cincinnati, Ohio, on 5 Sept. 1898.

In February 1900 a meeting of the regular National Convention was held at Omaha, Neb., resulting in a complete separation of the factions and a call for a national convention from each — the fusion at Sioux Falls, Iowa, and the anti-fusion at Cincinnati, Ohio, both for 9 May. The Sioux Falls Convention, in addition to the platform of previous conventions, vigorously denounced the imperialistic policy of the government, expressed sympathy with the Boers in their struggle with Great Britain, advocated public ownership of public utilities and condemned the practice of the courts in issuing injunctions in labor disputes between employees and employers. William J. Bryan was nominated for President and later by the Democratic Convention. Charles A. Towne of Duluth, Minn., was nominated for Vice-President after a lively contest to leave the second place vacant until action by the Democratic National Convention, and to accept the nominee. After the Kansas City Convention Mr. Towne declined the Populist nomination and the Populist National Executive Committee substituted Mr. Stevenson, the Democratic nominee. The Cincinnati Convention nominated Wharton Barker of Philadelphia, Pa., for President, and Ignatius Donnelly of Saint Paul, Minn., for Vice-President, and adopted as its platform:

> (1) Initiative and referendum; (2) public ownership and operation of those means of communication, transportation and production which the people may elect; (3) land for actual occupation only and alien ownership prohibited; (4) a scientific, or absolute paper money, based upon the entire wealth and population of the nation, not redeemable in any specific commodity, but a full legal tender for debts, taxes and public dues, issued by the government only in sufficient quantity to meet the demands of commerce, and free coinage of silver and gold at 16 to 1 until such currency system could be established; (5) graduated tax on incomes and inheritances; (6) election of president, vice-president, senators and Federal judges by direct vote of the people; (7) direct nominations.

Both wings of the People's party maintained national committees in 1903–04 with a representative from every State in the Union, and in the summer of 1903, through the initiative of the fusion wing, a joint meeting of the two National conventions was held at Denver, Colo., resulting in harmony, and in a united call for a meeting of both committees at Saint Louis, Mo., on 22 Feb. 1904 when plans for the approaching National campaign were discussed and it was positively decided to nominate independent candidates for the offices of President and Vice-President. At the National Convention, held later in the year, therefore, Thomas E. Watson of Georgia and Thomas H. Tibbles were selected to represent the party in the forthcoming election, at which they received a popular vote of 120,903. On 27 Dec. 1906 the Populist party in Kansas was officially disbanded. In 1908 the Populists polled only 28,131 votes for their candidates, Thomas E. Watson and Samuel W. Williams. The decline of the party appears to be jointly due to the increased rural prosperity since 1900, to its alliance with the Democrats, and to the fact that most of its demands have been enacted into law by the older parties. Consult McKee, 'National Conventions and Platforms' (1900); Reynolds, 'National Platforms and Political History' (1898); Peck, H. T., 'Twenty Years of the Republic' (New York 1907); Woodburn, J. A., 'Political Parties and Party Problems in the United States' (2d ed., ib. 1914).

PEORIA, pē-ôr'ĭa, Ill., the second largest city in the State and county-seat of Peoria County, situated on an expansion of the Illinois River called Peoria Lake, 155 miles southwest of Chicago. It is the centre of an extensive railroad system consisting of the Minneapolis and Saint Louis, the Toledo, Peoria and Western, the Lake Erie and Western, the Chicago, Burlington and Quincy, the Chicago, Peoria and Saint Louis, the Chicago and Alton, the Chicago, Rock Island and Pacific, the Chicago and Northwestern, the Sante Fé, Illinois Central, the Big Four, Vandalia, Rock Island and Peoria, Illinois Traction System and various other roads with interurban lines in course of construction. Many of these lines connect with the belt system of the Peoria and Pekin Union and with the Peoria Railway Terminal. The city is also connected with Chicago by the Illinois and Michigan Canal — five-foot channel, and the Illinois River is continuously navigable, eight feet from LaSalle, Ill., to the Mississippi River, giving an extensive trade by water. Peoria is built on a plateau 40 feet above the river extending back over the bluffs for two miles and completely surrounded with rolling prairies. It covers an area of about 10 square miles. Eighty-two miles of its streets are paved; it has a complete sewage system with all modern improvements and is noted for its beautiful parks, which are connected by boulevards. Bradley and Glen Oak parks are the largest and finest.

Industries.— Situated as it is, in the heart of an unrivaled agricultural region, a large portion of which is devoted to corn, the city possesses a great wholesale and retail trade in groceries, farm implements, hardware, dry goods, boots and shoes, drugs, paper, china and accessories. Nearby are large bituminous coal fields. The city is also the centre for a tremendous trade in fish, of which hundreds of thousands of pounds are caught in the Illinois River and shipped alive to Eastern cities. Peoria is undermined by a vast basin of water, percolating through gravel and affording to the manufactories an endless supply of absolutely pure water. This water maintains a temperature of 53 at all seasons of the year and this fact enables the manufacturer of corn products to secure the largest amount of starch from every bushel of corn, and has made the city a favorite place for the manufacture of glucose and alcohol. It is also the seat of several meat packing-houses, two large strawboard factories and other paper mills. Peoria is first in the manufacture of diversified agricultural implements and third in aggregate output; roofing, paper mills, wire fence works, paper bag mills, steel mills, agricultural implement factories, automobile works, foundries and other industries. It has been proven that Peoria possesses an advantage of 6 per cent in the manufacture of distillery products over any other point in the world. The city ranks first in the products of distilleries among the cities of the Union. The distilleries, of which there were seven until the manufacture of whisky was stopped by the government consumed over 100,000 bushels of corn daily, and paid into the United States treasury in internal revenue tax, on the manufacture of alcohol and high wines, $35,000,000 per year, a larger sum than any other revenue district in the United

States. Peoria has long been the centre of an enormous grain trade.

In 1918 Peoria ranked second in the receipts of corn, Chicago being first and Omaha third. Alcohol now produced is for the government. The remaining distillery plants have been converted to flour and syrup mills.

Peoria has 10 banks and savings institutions, one of which is the largest bank in the State outside of Chicago.

Public Buildings, Charitable Institutions, etc.—They are the city hall, court house, United States post office, numerous libraries, churches and public schools. The charitable institutions include the Proctor, Guyer and Bradley homes for the aged; the Proctor, the Peoria State, the Methodist and Saint Francis hospitals; Saint Joseph's Home, Home of the Good Shepherd and the Home for the Friendless.

Educational Institutions.— Besides an excellent public school and high school system consisting of two high and 22 grammar schools, there are — Bradley Polytechnic Institute, allied with the Chicago University (q.v.), endowed with $3,000,000 through the liberality of Mrs. Lydia Bradley, Spalding Institute endowed by the late Archbishop, John Lancaster Spalding (q.v.); the Academy of Our Lady of the Sacred Heart, several parish elementary schools and several conservatories of music. There are also the Peoria Law Library and a fine public library and branch libraries containing 100,000 volumes.

Government.— The city is governed by a mayor and city council, elected every two years. The mayor appoints, subject to the approval of the council, all administrative city officials, except the city attorney, treasurer, police magistrate and city clerk, who are chosen by popular vote. The expenditures for the year 1918, for municipal maintenance and operation amounted to $1,565,431.31, the principal items of which are as follows: Schools, $819,736.91; police department, $107,041.96; fire department, $112,320.56; public works, $124,608.55 and street lighting, $67,138.78. The balance is made up of miscellaneous items. Peoria has a magnificent park system, embracing some 500 acres. Bradley, Glen Oak and Madison Parks are the largest. A scenic driveway two miles long runs along the brow of the bluffs, 400 feet above Peoria Lake and the valley of the Illinois and affords a view of unrivalled beauty and extent. The park system has to date cost nearly $3,000,000. The annual expenditure is approximately $125,000.

Population.— In 1900 there were in the city as residents 8,900 people of foreign birth and 1,400 colored persons. Since the Federal census of 1900 was taken, North Peoria has been annexed, increasing the population nearly 3,000. Population (1900) 56,100; (1910) 66,950. Federal census estimate, 1915, 86,000 within city limits. Population, Greater Peoria, the three-mile district, 100,000. Directory census, 1918, 105,000.

History.— The site on which Peoria stands was originally a small Indian village and was visited by missionaries who were trying to convert the savages. LaSalle stopped here in 1680 for the winter and built a fort called Fort Creve Cœur which was abandoned the next year. The place afterward became a seat for considerable traffic in furs. In the last half of the 18th century French traders made a settlement here, but they were regarded with suspicion by the American, who looked upon the French as allies of the Indians. In 1783 Col. George Rogers Clarke conquered the settlement and shortly afterward erected a fort called Fort Clark which was in existence to 1818 when it was destroyed by fire. In 1812 General Craig with a small force of United States soldiers drove the French away altogether from the Illinois River. Congress afterward settled the claims of the French for damages caused by these depredations, by granting a tract of land to the original occupants of the soil, and these claims known as «The French Claims» were clouds on much of the property where the present city stands and have only been settled in recent years. In 1819 a new colony took possession of land, at first cultivating the land and giving attention only to farming, but gradually a village community was formed and in 1835 Peoria was incorporated. It was chartered as a city in 1845.

S. A. Oakley,
Editor Peoria Star.

PEORIA INDIANS, a North American tribe of the Illinois Confederacy, who formerly resided on the shores of Peoria Lake in central Illinois. In 1673 they were located on the west side of the Mississippi near the mouth of a river now believed to be the Des Moines. In 1688 they were found on the Upper Iowa River. After the war of the northern tribes against the Illinois Confederacy, the Peorias crossed over into Missouri. The main body, however, remained on the east bank of the Illinois River until 1832. In that year the tribe, very much reduced in numbers, sold to the United States all their claims in Illinois and Missouri and removed with the Kaskaskias (q.v.) to a reservation on the Osage River, Kansas. In 1861 with the Wea and Piankashaw tribes they took up their residence on a reservation in Indian Territory, now Oklahoma. In 1914 they numbered less than 150, the majority being of mixed blood, very few, if any, remaining of the original tribal stock.

PEPE, pā'pā, **Guglielmo,** Italian general and revolutionist: b. Squillace, Calabria, 15 Feb. 1783; d. at Turin, 9 Aug. 1855. When but 16 years old he joined the French party in Italy against Cardinal Ruffo and was captured and condemned to death, a sentence afterward commuted to exile. In 1802 he organized a conspiracy against Ferdinand IV, but was arrested and imprisoned. He was rescued by Joseph Bonaparte with whom he served for some time in the Parthenopean army, then fought with the French against Spain and later served under Murat, gradually working up in the service until he attained the rank of lieutenant-general in 1815. In 1820 he joined the Liberal party of Naples, known as the Carbonari, and in that year commanded the military revolt against the king. He entered Naples in triumph, 6 July 1820, and forced the king to accept his new constitution, but on 7 March 1821 was defeated at Rieti by the Austrians. He was again exiled and fled to London. The Austrian government with the sanction of the Holy Alliance then replaced the Bourbons on the throne. He returned in 1848, however, and was made commander-in-chief of the Neapolitan forces in the war with Austria and regained his lost favor by his gallant but ineffectual defense of Venice in 1849. He then abandoned his military career and retired to Paris; but returned to Italy in 1851, where he died four years later. At his request his remains were removed to Naples for burial. Among his works are 'Relation des Evènements Politiques et Militaires de Naples en 1820 et 1821' (Paris 1822); 'Memoires Historiques, Politiques et Militaires sur la Revolution de Naples' (London 1823); 'Memoires du Général Guillaume Pepe' (2 vols., Paris 1847); 'Histoire des Révolutions et des Guerres d'Italie en 1847–49' (1850).

PEPI I, or PHIOPS, the third Egyptian monarch of the 6th dynasty, called also MERI-RA. His reign began in 2795 B.C. and was prosperous and of some length. He is the first warlike Egyptian king of whom any record exists. He made an expedition against the Asiatic Mentu, who had gained possession of the Sinai Peninsula, and with large levies, against the Herusha and the Amu, people inhabiting the desert region east of the Delta. The latter enemies again assembled farther northward and again were defeated. He also sent a naval expedition against the "Terehbah," believed to have been the Syrians. The negro races of the south appear in Pepi's time as subjects to Egypt and furnish a contingent for the wars. He executed several public works and left more monuments and records than any other Egyptian ruler previous to the 12th dynasty. He is credited with having built the Sakkarah pyramid. His son, Pepi II, also called MEREN-RA, is remarkable for having reigned 90 years. However, the kingdom was in a sadly deteriorated condition at his death.

PEPIN, pĕp'ĭn (Fr. pā-păṅ), or **PIPPIN II,** known as PEPIN LE GROS or PEPIN OF HERISTAL, Duke of the Franks: d. Jupille, 16 Dec. 714. He became mayor of the palace in Austrasia, under Dagobert II., fought successfully against the Germans and by the victory of Testry (687) gained control of Neustria and Burgundy and was recognized as mayor of the palace in the three kingdoms, becoming thus the actual ruler of France for 27 years, though appearing to serve under four nominal kings. His power was royal and generally despotic, though he permitted the defeated king of Neustria, Thierry III, to retain the title, the latter being the first of the so-called "do-nothing" kings (*rois fainéants*). A side light is thrown on his character by the commissioning of Willibrord as a Christian missionary to Friesland and his establishing a see for him at Utrecht. At his death Pepin left his power undiminished to his son, Charles Martel (q.v.).

PEPIN THE YOUNGER (called also "The Short"), king of the Franks and the first of the Carlovingians; b. about 715; d. 24 Sept. 768. He was the second son of Charles Martel, who succeeded his father, Pepin of Heristal. Martel was not only able to maintain, but so to extend his power that his two sons, Karloman and Pepin the younger, were able to share the kingdom between them, Pepin receiving Neustria and Burgundy. After his brother entered a monastery in 747, Pepin became sole ruler and having secured the deposition of the nominal king, Childéric III, in 751, by agreement with Pope Zachery, he was proclaimed king of the Franks. Shortly after, Pope Stephen III, pressed by the Langobards under Aistulf, applied to France for aid and by a visit paid to Pepin induced him to march to Italy, where he signally defeated the Langobards, or Lombards, as they were commonly called and made the Pope a present of the lands which he had conquered from them. These lands, known historically as the "donation of Pepin," formed the nucleus of the papal states. After a second expedition to Italy, to which he was compelled by the treachery of the Langobards, he defeated the Bavarians and warred successfully with the Saxons (753–57). He was succeeded at his death in 768 by his son, Charles the Great, usually called Charlemagne (q.v.).

PEPIN LAKE, an expansion of the Mississippi River between Goodhue and Wabasha counties, Minn., and Pierce and Pepin counties, Wis., 60 miles below Saint Anthony's Falls, covering an area of 38½ square miles. It is nearly 22 miles long and two and one-half miles across at its greatest width. Its greatest depth is 56 feet, but the usual depths are from 25 to 30 feet. The lake was undoubtedly formed by a natural dam or delta deposited by the Chippewa River, flowing in from the east. The swifter current of the latter river enabled it to bring down material too heavy for the slower stream to remove. The gorge of the Mississippi at this point must have been over 50 feet in depth. Along the shores are vertical cliffs of limestone reaching 400 feet in height and weathered into picturesque spires and turrets, and castellated battlements, and is surrounded by cliffs. On its shores are the city of Red Wing, Minn., at the head of the lake, Lake City, Minn., Wabasha, Wis., and Point au Sable, once the site of a French fortress.

PEPITA JIMÉNEZ. The publication in 1874 of Juan Valer's 'Pepita Jiménez' marks an important date in modern Spanish literature. The literary reputations of Fernán Caballero and Avellaneda were always more or less local, but Valera, poet and critic as well as novelist, was known throughout Europe and the Americas as a diplomat as well as a man of letters. 'Pepita Jiménez' was the first of a long series of novels by Valera himself, Pardo Bazán, Galdós, Pereda, and Blasco Ibáñez, which showed the world that Spain possessed a great modern novel. 'Pepita Jiménez' has met favor not only in Spain and in Spanish America, it has been translated into English, French, German, Italian, Portuguese, Bohemian and Polish. This popularity is due to the fact that it is a love story, a literary love story with a philosophical and mystical flavor to it that has endeared it to the mature reader. Valera who had been accused of attacking the Church in his treatment of his hero, Luis, maintains that he was not concerned with the fact as to whether he was more pious or less pious. He had written a work for the entertainment of his readers and if the public has taken delight in reading his novel he has attained his goal. As a fact if Luis had not been a youth about to take orders who succumbs to the feminine charms of Pepita and gives up the Church, the author would not have had the opportunity to develop his delicate psychological study of a "cas de conscience." The whole charm of the novel lies in its religio-mystical touch which Valera had imbibed from Luis de León and Santa Teresa, the two great mystics of Spanish literature. Valera acknowledges with graceful modesty that if there is any charm in 'Pepita Jiménez' it has come from these favorites of his whom he has despoiled to embellish his own work. Others of Valera's novels may be technically more perfect and more psychological in their character drawing, but 'Pepita Jiménez' has been the most popular both in and out of Spain. It is an exquisite example of Spanish literary art which Coventry Patmore has described as possessing "that complete synthesis of gravity of matter and gaiety of manner." In addition to the Appleton edition there is an abridged edition with notes and vocabulary by G. L. Lincoln (published by D. C. Heath and Co.) in which there is an excellent bibliography.

SAMUEL M. WAXMAN.

PEPOLI, pā'pō-lē, **Gioacchino Napoleone**, MARQUIS, Italian statesman: b. Bologna, 6 Nov. 1825; d. Rome, 26 March 1881. He was a grandson of Murat, and in 1848 in the war with Austria, being in command of the national guards, defended his native city for some time against the Austrian troops, but upon the capitulation of the garrison was forced to flee into Tuscany. After the restoration of the Pontifical government he returned and devoted himself to the study of finance, publishing in 1856 a work on that subject. Later, in 1859, he became chief of the provincial government in Bologna. Upon the annexation of Romagna he became a member of the Left Centre of the Italian Parliament, and in 1862 was appointed Minister of Commerce, and later of the interior. From 1863–64 he was Ambassador to Saint Petersburg; from 1868–70 was Ambassador at Vienna; and from 1868 until his death in the year 1881 he was a senator in the Italian Parliament.

PEPPER, George Dana Boardman, American educator and theologian: b. Ware, Mass., 5 Feb. 1833; d. 30 Jan. 1913. He graduated from Williston Seminary, Easthampton, Mass., in 1853; from Amherst in 1857, receiving the degree of D.D. in 1882; from Newton Theological Institution in 1860, which conferred upon him the degrees of D.D. in 1866 and LL.D. in 1890. Colby University in 1867 and Amherst in 1882 gave him the degree D.D., Lewisburg University in 1882 and Colby University in 1890 also gave him LL.D. After completing his studies, he became pastor of the First Baptist Church of Waterville, Me., where he remained for five years, from there going to Newton Theological Institution as professor of ecclesiastical history, occupying that position until 1867. In 1868 he became professor of systematic theology in Crozer Theological Seminary at Upland, Pa., and served in that capacity until 1882, in which year he received a call to the presidency of Colby University. Ill health caused him to resign from his duties as president in 1889, and for three years he traveled. Upon his return in 1892 he was appointed to the chair of Biblical literature in Colby University, a position he held until 1900. He has published 'Outlines of Theology' and written numerous articles for theological reviews.

PEPPER, George Wharton, American lawyer and author: b. Philadelphia, Pa., 16 March 1867. After graduating from the University of Pennsylvania in 1887, he took a two years' course in law there and was admitted to the bar in 1889. He practised law until 1893, when he was appointed Algernon Sydney Biddle professor of law in the University of Pennsylvania, where he remained until 1910. In 1915 he was Lyman Beecher lecturer in law at Yale University. He has written 'The Borderland of Federal and State Decisions' (1889); 'Pleading at Common Law and Under the Codes' (1891); 'Digest of the Laws of Pennsylvania, 1700–1901,' and 'Digest of Decisions and Encyclopædia of Pennsylvania Law, 1754–1898' (with W. D. Lewis, 1902); 'The Way' (1909); 'A Voice from the Crowd' (1915).

PEPPER, John Henry, English chemist and mechanical inventor: b. Westminster, England, 17 June 1821; d. Leytonstone, Essex, England, 29 March 1900. He was appointed analytical chemist at the Royal Polytechnic in 1848 and in 1852 was made a salaried director of the institution, a position which he held for 20 years. He was very popular as a lecturer with the stereopticon and introduced a number of clever optical illusions. He is best known as the exhibitor of "Pepper's Ghost," the invention of Henry Dircks, but made a practical success by the ingenious stage adaptations of Professor Pepper. He succeeded in presenting on the same stage living persons and phantoms as acting simultaneously. Pepper traveled with this invention in the United States and Australia, and in the latter country accepted the position of public analyst in Brisbane, Queensland, where he remained for some years. He returned to England in 1890 and essayed a revival of the "Pepper's Ghost" exhibitions, but public interest was centred on other amusements, and Professor Pepper retired to his home in Essex. He published 'The Boys' Playbook of Science' (1860); 'The Playbook of Metals' (1861); 'Scientific Amusements for Young People' (1861); 'Cyclopædic Science Simplified' (1869); 'The True History of Pepper's Ghost' (1890), etc.

PEPPER, William, American physician: b. Philadelphia, Pa., 21 Aug. 1843; d. Pleasanton, Cal., 28 July 1898. He was the son of Dr. William Pepper, a Philadelphia physician of great repute, and professor of the theory and practice of medicine in the University of Pennsylvania at the time his more eminent son matriculated there. He was graduated from the University of Pennsylvania in 1862, and from its medical department in 1864. Beginning practice in Philadelphia, he speedily attained distinction. In 1868–70 he was lecturer there on morbid anatomy; on clinical medicine in 1870–76; and was professor of clinical medicine in 1876–87, when he was appointed professor of the theory and practice of medicine. From 1881–94, when he resigned, he was provost of the university, and under his administration the institution made phenomenal progress, the number of instructors increased from 88 to 268, the material equipment and endowment rose from $1,600,000 to more than $5,000,000, many new departments were added and through his efforts the university hospital was established. He founded the Philadelphia *Medical Times* and edited it in 1870–71; was one of the founders of the Pennsylvania Museum and School of Industrial Art; through his efforts the course of study in medicine was extended to four years; and an endowment fund for the medical department was established and received a gift of $50,000 from him on his resignation. He was medical director of the Centennial Exhibition of 1876, and for his services was made Knight Commander of Saint Olaf by the king of Sweden. He was prominently connected with the leading medical organizations of the country. He published 'Trephining in Cerebral Disease' (1871); 'Local Treatment in Pulmonary Cavities' (1874); 'Higher Medical Education' (1877); 'Phthisis in Pennsylvania' (1886); A Text-book on the Theory and Practice of Medicine' (1893), and several others; besides uncounted contributions to medical periodicals. He also edited the 'System of Medicine by American Authors,' regarded as the American authority on medical questions. Consult the biography by F. N. Thorpe (1904).

PEPPER, a popular name for several plants and their products. The best known is common or black pepper (*Piper nigrum*) of the family *Piperaceæ*, a native of the East Indies, whence it has been introduced into many tropical countries (especially the West Indies and northern South America, where it is an important commercial crop). The plant is a climbing shrub often more than 15 feet tall, with smooth soft stems which bear pointed, heart-shaped, leathery leaves, opposite which are spikes of mostly perfect flowers, followed by little red fruits. The plants are propagated by cuttings, which when well rooted are set near small trees over which they can spread, or in fields where poles are provided as supports. In about four years the plants commence to bear and continue to yield two crops annually for 10 years or more. As soon as the earliest berries commence to color, the whole crop is harvested to prevent loss by dropping and to retain the pungency. After drying the product is ready for market. White pepper is derived from dried black pepper by soaking in water and rubbing off the dried fleshy covering. The pungent qualities of black pepper are dependent mainly upon an acid volatile and an acrid resin. Meleguetta or Guinea pepper is derived from species of the families *Anonaceæ* and *Zingiberaceæ;* and Jamaica pepper or pimento from the family *Myrtaceæ*.

The red peppers of the temperate zones are various species of *Capsicum*, particularly *C. annuum* and *C. frutescens*, the former an annual herb, the latter a shrubby perennial. The former is the parent of the peppers of Northern gardens; the latter, being slower in its growth, is found only in the South. The species are all natives of tropical America, where they were cultivated for condimental uses prior to the landing of Columbus, who took specimens back with him to Europe. It seems, however, to have been introduced into European gardens by way of Africa. In the South the fruits, green or ripe, are very popularly used as a condiment and for mixing with pickles. Some varieties are used for special purposes; for example, the little-fruited sorts, which are ground to make Cayenne or red pepper, and the Tabasco variety, which forms the basis of Tabasco sauce. The green peppers of Northern markets are merely immature red peppers. They are used for salads and for making "mangoes," the contents being removed and chowchow pickles put in their place. Olives are often stuffed with minced pepper which has been steeped in olive oil. The plants are grown from seed started under glass and transplanted to the field after all danger of frost has passed. They require a fairly light, rich soil, plenty of sun and a warm season. Their insect enemies are the same that attack the egg-plant.

PEPPER GRASS, See CRESS.

PEPPER-POT, a prepared food common in the West Indies, of which cessareep (q.v.) is the principal ingredient, together with fresh or dried fish and vegetables.

PEPPER-ROOT. See DENTARIA.

PEPPER-TREE, PERUVIAN MASTIC-TREE, or **PEA-TREE,** several species of the genus *Schinus* of the family *Anacardiaceæ*. Only two of the 20 species are cultivated. In California they are popular as far north as San Francisco. *Schinus molle* is the commoner species. It is an evergreen tree 20 or more feet high with rounded top, pendulous branches and yellowish-white flowers in conical panicles followed by fruits about the size of peppercorns. The narrow leaves are rich in a resinous fluid which they discharge into the air especially after a rain when the tissues become turgid. Next to the blue gum tree (*Eucalyptus globulus*) this has been the most popular ornamental tree, but owing to its acting as a harbor for scale insects, etc., it has suffered in orange-growing districts, thousands of trees having been cut down because of this.

PEPPER-WOOD, a popular name for *Xanthoxylum clava-Hercules*, also known as "Hercules Club," and Toothache tree. It is a very spiny tree of shrubby size and growth, growing in coast lands from Virginia to Florida, and westward to Texas and Arkansas. It has been called erroneously southern prickly ash, and under this title its bark is found in commerce for medicinal use. See XANTHOXYLUM.

PEPPERELL, pĕp'ėr-ĕl, SIR **William,** American general: b. Kittery Point, Me., 27 June 1696; d. there, 6 July 1759. He joined his father in business as a merchant and the firm was for many years the largest mercantile house in New England. He ultimately became sole owner of most of the towns of Saco and Scarboro, and held large properties in Portsmouth, Hampton and other places. In 1722 he was elected colonel of the Maine militia; and in 1727 was elected one of his majesty's council for the province of Massachusetts, and was regularly re-elected for 32 years in succession. Living on an exposed frontier, where the inhabitants were constantly engaged in warfare with the savages, a large portion of his life was spent in the camp. When the expedition against Louisburg was undertaken, the governors of New England gave him the command of the troops. Beginning the siege in May 1745, he compelled the city to surrender on 16 June, and in reward for his services was made a baronet. In 1755 he was commissioned a major-general in the British army, and given command of forces protecting the frontier of

Maine and New Hampshire. From 1756 to 1758 he was acting governor of Massachusetts. In 1759 he was appointed lieutenant-general. His grandson was created a baronet in 1774, and embraced the royal cause during the Revolutionary War, in consequence of which his estates were confiscated. Consult Parsons, U., ‹Life of Sir William Pepperell› (Boston 1885); Parkman, F., ‹A Half Century of Conflict› (Boston 1892); Brooks, C., ‹Sir William Pepperell› (Boston 1903).

PEPPERELL, Mass., town in Middlesex County, 35 miles northwest of Boston, on the Nashua River, and on the Boston and Maine Railroad. The Lawrence Library and the Wolcott monument are located here. The town has manufactures of paper and cards and owns the water-supply system. Pop. 2,953.

PEPPERIDGE, a popular name in some localities for *Nyssa sylvatica,* which is known also as tupelo, black gum and sour gum. See TUPELO.

PEPPERMINT. «Mint» was among the plants first recognized as of value by the ancients, and many interesting references to it are found in the earliest known literature. Its extreme antiquity is evidenced by the fact that it was known in Greek mythology, where it was given a birth both romantic and divine in connection with the loves of the gods. «Mintha» (Μίνθη), a beautiful girl, had won the affections of Hades, and in a fit of jealousy was transformed by Ceres into the plant which was then given her name, from which followed the Latin «*Mintha,*» «*Mentha,*» and «*Menta.*» There still exists under this name in Pylos, Greece, *Mount Mintha,* upon which the transformation occurred. At the base of the mountain was in ancient times a grove dedicated to Ceres and a temple to Hades. This romantic tradition is recorded by Strabo (Geographia, liber VIII), Julius Pollux, and others.

Hippocrates, the most celebrated physician of antiquity, b. about 460 B.C., mentions the virtues of mint, and also says «It excites to love.» Aristotle, b. 384 B.C., describes its well-known beneficial effects upon the human system, and Theophrastus, his successor, in his ‹History of Plants,› also mentions its various virtues in a most interesting way under the newer name which had been given it of Ἡδύοσμον (fragrant, or sweet-scented). This name is also used in both the Greek gospels, which record the well-known utterance of Jesus, from which we learn that taxes were annually paid in this plant, indicating that it had already become an article of regular commerce.

A very interesting account of mint is given by Pliny (23–79 A.D.) in his ‹Historia Plantarum› (liber XIX, cap. 8), where he mentions the methods of propagation, its use in banquets, etc., and its various medical virtues. Ovid also speaks of its having «magical power.» Much prominence is given to its virtues in the writings of the great physicians of antiquity, including Galenus, Avicenna, Celsus, etc.

Commercial History.— There are many species of the genus *Mentha* noted by various writers, but by far the most important and the only one cultivated or distilled in a large commercial way in Europe or America is the true peppermint plant, *Mentha piperita.* The regular cultivation of this plant in a commercial way began in Surrey, England, about 1750, where at that time only a few acres were devoted to medicinal plants. Fifty years later about 100 acres were under cultivation. The growers, having no distilleries of their own, sold their plants to London chemists who were engaged in distilling other products as well; but afterward distilleries were built at the sources of production to save transportation expenses. The industry in England reached its maximum about 1850, the area under cultivation being about 500 acres, after which it began rapidly to decline owing to the growth of the American industry.

The inception of the industry in America occurred in 1816, in Wayne County, N. Y., which for a number of years was the chief producing centre of the world, but in the year 1835 it was inaugurated in Michigan, a region, with soil of extreme fertility, under climate conditions especially favorable, which soon became the chief producing centre of the world, a position it has since maintained. It is accordingly of interest to note that over three-fourths of all the true peppermint of the world is produced within a radius of 75 miles of the city of Kalamazoo. Besides the climatic advantages and fertile soil of Michigan, radical improvements were effected here in the apparatus for distillation, implements of cultivation, etc., enabling the process to be conducted with far greater rapidity, and materially enhancing the quality. The business, which had hitherto been in a crude state, now began to assume a more systematic form.

Peppermint, as is well known, is cultivated chiefly for its «essential oil,» in which are secreted the aroma and virtues of the entire plant. This exists in minute cells in the leaves and blossoms. Distillation is effected by placing the plants, which have been harvested and dried, in large vats, thoroughly packed and closed with air-tight covers, steam being admitted to the bottom of these vats by means of pipes and valves. The oil cells are ruptured by the heat, the oil escaping upward with the current of steam. The steam thus impregnated with oil flows through condensers where it is converted into oil and water, from thence flowing into the «receiver,» where the oil, which is lighter, floats upon the top, while the water settles below and is again forced into the boiler to be reconverted into steam for successive charges.

The product thus obtained is the crude or «natural» oil; but this although «pure» contains some resin extracted from the stems, and some approximate hydrocarbons. The quality is consequently greatly improved by an intelligent «fractional distillation» by which the objectionable properties may be separated, the refined product being the «quintessence» of the plant, with a rich and mellow aroma.

The soil now mostly used for mint culture is formed by the deposit during many centuries of the decay from acquatic plants, forests and other vegetation growth in the beds of ancient lakes. Being soft and porous, it is necessary to provide the horses with «mud shoes,» which are fastened to their hoofs to prevent sinking.

The essential parts of a distillery are a boiler for generating steam, a series of vats for containing the plants and a condensing apparatus, these all being connected by a system of pipes, valves, etc. Auxiliary to these in the larger «stills» are engines, steam cranes, etc., for economizing labor. While the first distilleries had a capacity of only five pounds per day of oil, the distilleries of the most modern type and installation have a daily capacity each of 400,000 pounds of plants, yielding about 1,500 pounds of oil. Much of the labor formerly done by hand is now accomplished by steam and other forms of power.

The production in America of peppermint during the past 10 years has averaged annually about 60,000,000 pounds of plants, yielding between 150,000 and 400,000 pounds essential oil. About half of the entire production is used in America, the other half being exported to foreign countries. An oil sold as «Peppermint» is distilled largely in Japan, which, however, is not produced from the true peppermint plant, but from *Mentha arvensis*, and is inferior in flavor, etc.

Peppermint in the pure state is highly agreeable and beneficial and its consumption is rapidly increasing, owing to the new uses which have been found and an increased demand for those purposes to which it has long been applied; its chief use being in medicine, confectionery, chewing gums, toilet articles and fine pharmaceuticals.

PEPSIN, a group proteolytic enzyme or a ferment believed by some to be secreted by the mucous lining of the stomach. By other investigators it is held to be a product of an antecedent substance called pepsinogen with hydrochloric acid. It has never been prepared in the pure state, but it is believed to be of a proteid nature. When present in a feebly acid solution, at a temperature approximately the same as that of the human body, from 98° to 105° F., pepsin possesses the power of splitting proteins into metaproteins, proteoses and soluble peptones, and thus rendering them capable of absorption in the alimentary canal. This action is greatly enhanced by the presence of one-twentieth of 1 per cent of hydrochloric acid. Owing to this remarkable power, pepsin is a highly important agent in the chemistry of digestion, and it is very commonly administered, in medicine, when the quantity secreted by the stomach is deficient. It is rendered inert by alkalis and recovers very slowly. A moist heat of 200° F. destroys its power. The commercial supply of pepsin is obtained from the stomachs of hogs, sheep or calves, and its digestive power varies considerably. When extracted with glycerine for 12 to 24 hours, the product is pepsinogen. A solution containing two grains of pepsin in one ounce of water, and acidified by the addition of five minims of hydrochloric acid of specific gravity 1.16, should dissolve at least 100 grains of the white of hard-boiled egg in 30 minutes, if the egg is finely divided, and the mixture is kept at 125° F., and constantly stirred. The total solvent power of pepsin is much greater than this, however, and in normal digestion one grain of pepsin probably dissolves as much as 3,000 grains of coagulated albumin. Specimens of pepsin have been prepared which have dissolved as much as 25,000 times their own weight of coagulated proteid, and some authorities are of the opinion that pepsin is theoretically capable of exerting its peculiar powers indefinitely, without being itself destroyed in the process. There is evidence that pepsin is reabsorbed by the alimentary canal to a considerable extent, and returned to the secreting glands of the stomach for repeated use; and it has also been detected in the muscles and in the urine. The pepsin of commerce is an amorphous powder, of a yellowish-white color; but the substance is also administered in the form of elixirs and in many other ways. When kept dry and at a temperature not above 100° it retains its properties indefinitely. It is used, not only as a digestive corrective, but also for effecting the solution of various superficial necrotic tissues, such as diphtheritic membranes. Its existence was first recognized by Schwann (1836) and Wasmann (1840). Consult Hawk, P. B., ‘Practical Physiological Chemistry’ (Philadelphia 1913); Mathews, A. P., ‘Physiological Chemistry’ (New York 1915).

PEPYS, pĕp'ĭs, pēps, or pĭps, **Samuel**, English diarist: b. at Bampton, 23 Feb. 1633; d. London, 26 May 1703. He was educated at Saint Paul's School and Magdalen College, Cambridge, and early acquired the patronage of Sir Edward Montague, afterward Earl of Sandwich, who employed him as secretary in the expedition for bringing Charles II from Holland. On his return he was appointed one of the principal officers of the navy, in which, through his high favor with the king, he introduced many reforms. In 1673, when the king took the Admiralty into his own hands, he appointed Pepys secretary to that office. He was employed under Lord Dartmouth in the expedition against Tangier, and often accompanied the Duke of York in his naval visits to Scotland and coasting cruises. During the excitement of the Popish plot he was, at the instigation of the Earl of Shaftesbury, committed to the Tower on an unfounded charge of aiding in the design to dethrone the king and extirpate the Protestant religion, but was presently discharged without a trial, and reinstated in his office at the Admiralty, which he held until the abdication of James II. On the accession of William and Mary he resigned his office and devoted himself to publishing his ‘Memoirs’ (1690), relating to the navy for 10 years preceding, and led a retired life from this time till his death. Besides being a recognized authority on naval affairs, he was well versed in history, architecture, painting and sculpture. He was president of the Royal Society in 1684–86. He left a large collection of manuscripts to Magdalen College, Oxford, known as the Pepysian Library, and consisting of naval memoirs, prints and five large folio volumes of ancient English poetry, begun by Selden, and carried down to 1700, from which Bishop Percy made numerous selections for his ‘Reliques of Ancient English Poetry.’ His unique ‘Diary’ (begun 1 Jan. 1660 and ending 31 May 1669, on account of defective eyesight) affords a curious picture of past manners and particulars of the Stuart court. It was written from day to day in a sort of shorthand which was deciphered by the Rev. J. Smith, and first published under the editorship of Lord Braybrooke in 1825. Fuller editions have since been published, the fullest being that of H. B. Wheatley (1893). Consult Wheatley, ‘Samuel Pepys and the World he Lived In’ (1880); Stevenson in ‘Familiar Studies’ (1892).

PEPYS' DIARY. Samuel Pepys' diary is a minute daily chronicle for about 10 years (1659–69) of the life of a young man in his 20's and 30's engaged in important public office during the momentous period of the restoration of the Stuarts to the throne in England. It reveals with complete frankness the most intimate details in the personal, family and official life of the author; his relations with his wife, relatives, friends, patrons and servants; the shifts by which he acquired over £6,000 in six years of government service, the back-stairs gossip and political wire-pulling of Whitehall, and his own manœuvres in the Navy Department; his weakness for drink, fine clothes and playhouses, his resolutions to abstain therefrom, his backslidings and consequent regrets; his salacious interest in ladies of easy virtue at court and elsewhere, all the life of London as it came under his shrewd eyes in the public places of the time. It was with keen regret that, owing to growing weakness of sight, he desisted from keeping his record. Its charm rests partly upon the concreteness with which he sets down his experiences and impressions, but also on his point of view. His morals, decent enough for a thriving middle class official of the time, differ somewhat from ours, but not so much as to put us out of sympathy with him. He writes out the minutest motions of his own nature, all the petty feelings, vanities and virtues that most men feel but seldom acknowledge and never mention even to themselves. Consequently to read Pepy's diary is to undergo a series of those pleasurable little shocks which make the charm and zest of racy gossip about people we ourselves know. Much of this amusement is at Pepys' expense, a fact likely to make us forget that he was really a person of consequence in his day. Beginning as a kind of clerk, he became the most useful man in the Navy office, capable, industrious, determined and for the age not unusually corrupt. He suffered from some political vicissitudes, was ousted from his position, but gained others, and sat in Parliament. He figures in later years as rather more than an acquaintance of artists and writers like Kneller and Dryden and as a collector of books. The manuscript of his diary, written in cipher, was left ultimately with his library to Magdalen College. It was not published, and then but in part, until 1825. A full edition appeared in 1895.

William Haller.

PEQUOT, pē'kwŏt, Conn., the name of a former Indian fort on Pequot Hill, an elevation 180 feet above sea-level in the eastern part of the town of Groton, and eight miles northeast of New London, Conn. (q.v.).

PEQUOT INDIANS, a tribe of North American Indians at one time an integral part of the Mohegan tribe and of the Algonquian family. In the early part of the 17th century they occupied a narrow strip of the coast of New London County from the Niantic River to the boundary line of Rhode Island, where London, Groton and Stonington now stand. At their zenith they numbered upward of 3,000, were warlike and powerful in the country round the Thames River when Connecticut was first settled, and made treaties with the Dutch and English. Hostilities broke out with the whites in 1637, and the tribe was cut to pieces and scattered. Some fled to Long Island, where a few remained, but most of these with the larger part of the tribe were distributed among the Mohegan, Narragansett and Niantic tribes, where they had their own villages but were forbidden to use their tribal name. A few descendants may be found at Green Bay, Wis., and a few may still be found in the old Groton tract.

PEQUOT WAR. See Colonial Wars in America.

PERAK, pā-räk', one of the federated Malay states, under British protection, lying between 3° 37' and 6° 5' N., and between 100° 3' and 101° 51' E. on the west coast of the Malay Peninsula, north of Selangor, south of Siam and Kedah and west of Pahang, Kelentan and Petani. Extreme length, 172 miles; extreme breadth, 100 miles; coast line, 90 miles; area, 7,800 square miles, including the 1,000 square miles recently conveyed to Perak by Siam. The region is crossed by two parallel ranges. Between them lies the Perak River, the only navigable stream in the country; steamers go up it 40 miles, and trading boats 200 miles. The climate is very damp, the annual rainfall being 223 inches. The climate is hot on the coast and the river plains, and much cooler in the mountains; the mean temperature along the coast is 87° F. by day and 78° by night. The total area of land occupied is (1913) 850,824 acres — 142,649 in rubber; 90,644 in cocoanuts; and 85,513 in general agriculture. Sugar, tobacco and rice grow in the plains; tea, coffee and vanilla in the uplands. Opium is extensively grown and the rubber plantations in 1913 covered 60,000 acres in the Kiuta district alone, and 19,500 trees were tapped. The exports of copra are large, amounting to a value of $800,000 annually. The forests are under the control of the government and systematic reforestation with valuable cabinet woods is carried on. The forest reserves in 1913 covered 288,451 acres — about 6 per cent of the whole area of the State. Irrigation is practised increasingly, the government appropriation in 1913 being $130,600. The principal acreage watered is the 70,000 acres of rice fields. The irrigation canals also carry the water supply for the districts traversed. Deer, snakes, leopards and elephants are found in the hills, and there are crocodiles in the rivers. The mineral resources are great. Tin is the metal of largest value. It is found everywhere throughout the State, on the tops of the highest mountains and in the soil of the river swamps. The centre of the tin-mining industry is the Kiuta Valley, 30 miles long and 12 miles broad. For the year 1913 (the latest records published since the outbreak of the war) the exports of tin amounted to a value of $27,866,186. Tungsten ore (wolfram) and gold were also exported in small quantities. Silver, lead, iron, copper, zinc, arsenic and titanium are also found. A railroad connects the centre of the mining district, Kiuta, with Kuala Kangsar, and this road is being extended to Wellesley. There are also 776 miles of metaled roads in the State and 19 permanent road bridges. There are 204 government schools and 18 others under governmen inspection. The enrolment is 13,563, and the average daily attendance, 81.32 per cent. The exports for 1913 totaled $40,542,615 and consisted of principally tin, rubber, copra and rice. The imports were valued at $19,468,032 and were chiefly opium, tobacco and cigars, iron ware, machinery, petroleum, cotton goods and cattle. The population by the 1911 census was 494,057; more than two-thirds being males, owing to the preponderance of Chinese miners. There is continual immigration from China and India, so that the Chinese far outnumber the Malays.

Perak was long ago settled by the Malays. The Dutch made a settlement by treaty in 1650, but were repeatedly driven out by the natives and in 1795 by the English, who in 1824 made a treaty with Siam by which Perak's independence was recognized in spite of Siamese conquest in 1818. In 1874 British intervention was asked by one of the native sultans; a year later the British resident was murdered; the resulting punitive expedition brought the country under British protective control, though Perak was still nominally independent. Perak joined the Federation of the Malay States in 1895–96.

PERCEFORÊT, pars'fo-ra, French legend giving the history of Britain before the days of King Arthur. It was first printed in 1528 in Paris and is supposed to have been composed about the 13th century. According to the work King Perceforêt visited Britain with Alexander the Great and was made king. The work is unlike the later romances of chivalry in that it deals with enchantments, visions and superstitions rather than doughty deeds in battle. It was very popular in the Middle Ages and is valuable to-day for the insight it gives us of life as it was lived in mediæval times.

PERCEPTION. In its psychological meaning, perception is the direct conscious apprehension of physical objects and events through the medium of the senses. Thus one perceives trees, animate objects, one's own body, rhythms, harmonies, progressive movements, etc. By some psychologists the term perception has been rigidly interpreted as simply the sensation or sense testimony, and all thought activity aroused by the excitement of the senses as being a distinct mental process termed ideation. By the larger number, however, perception is regarded as including cognition. Thus, one sees a tree, but also recognizes it as an oak tree, and perhaps, still further, as a white-oak tree. The perception is evidently inclusive of the cognition that the tree is of the family of the oaks, and of the variety white-oak. In another more complex phase, one may look down a long stretch of railroad track and «see» a minute blackish dot capped with a tiny white cloud. That is the sense testimony; but it is obvious that the perception is that a train is approaching. We perceive not the dot and the cloud, but the train. Hence it is held that perception includes recognition. Perception is frequently contrasted with ideation in which the object is «thought» or «imagined,» but not seen or heard or handled. Although the objects of perception are innumerable, and the sensory materials involved of great variety, the forms of perception, that is, the ways in which sensations are interwoven and compounded, are reducible to three primary types; one form or pattern underlying spatial perception, a second underlying the perception of temporal sequence and order, and a third furnishing a basis for the apprehension of the qualitative nature of things. The perceptual consciousness is constantly undergoing, both in the individual and in the race, elaboration and refinement. For, in the individual, experience is continually investing the apprehension of objects with new shades of meaning and, in the animal series at large, evolutionary processes have modified and are still modifying both the structures and functions of the nervous system and the external organs of sense.

Inasmuch as perceptual knowledge comes by way of the senses, the most obvious mode of classification is by reference to the various sense-departments. This plan of classification would yield one large group of visual perceptions, another of auditory, a third of tactual, and so on through the senses. It would include, also, perceptions in which more than one sense-department is involved. Sight mediates the largest number of perceptions. The primary function of vision is the apprehension of *objects;* the primary function of audition, the apprehension of *events.* Vision, in conjunction with tactual and kinæsthetic sensations, gives us our spatial world — objects which are of various sizes, colors and shapes, which occupy various positions and offer, to each other and to the experiencing individual, varying degrees of resistance. The ear is less well equipped than the eye for spatial perception. It is only by aid of the eye and of the skin, tendons and muscles that sounds acquire definite spatial characteristics. But hearing is rich in qualities, the normal ear distinguishing several thousand tones and noises; and it is also quick to detect rapid and complicated changes in the environment. The three chief functions of the ear are the perceptions of human speech, of music and of the sounds of nature. Tactual perceptions, that is, perceptions mediated by nervous organs lying within the skin, inform us — though not so accurately or so minutely as visual perceptions do — of the spatial characteristics of objects; their size, position, form, etc. They also acquaint us with the texture (roughness, smoothness, bluntness) and the temperature of objects, and with the condition of the skin itself (whether wet or dry, irritated or bruised). When reinforced by sensation-elements from muscles (muscular pressure), tendons (tendinous strain) and joints (articular pressure), tactual sensation-complexes furnish knowledge of the weight, resistance, extent and movement of objects and of the position and movement of the observer's own body. The perception of bodily orientation is aided by a specific quality of sensation set up within the semi-circular canals of the ear. Finally, tactual factors, pressure, temperature and pain, in co-operation with sensations of taste and smell, bear information regarding the nature of food and other substances placed in the mouth. Olfactory sensations serve, by themselves, to acquaint the individual with the nature of odorous substances. The perception of the state of the large organs within the body is mediated, for the most part, by sensations set up in these organs themselves; for example, the stomach, heart and lungs.

Perceptual knowledge is by no means infallible. Its ambiguities and inaccuracies are termed illusions. They may arise when an object is perceived under varying conditions (for example, a stick looks longer in a vertical than in a horizontal position) or when a perception falls into conflict with the results of objective measurement or of some other standard of knowledge (for instance, a filled right angle seems to contain more than 90°). Certain illusions are ineradicable factors of normal experience; others — as illusions of insanity — rest upon derangement of mental function. Hallucination is generally considered to be a more serious derangement of perception than illusion. The hallucinatory object either does not exist at all — as in certain deliriums — or it exists in quite a different form from the actual object; for example, the mistaken apprehension of subjective noises as human speech. The perceptions of the dream-consciousness may be considered as hallucinations of a normal type. Consult Angell, J. R., 'Psychology' (New York, 1904); James, W., 'The Principles of Psychology' (New York 1913); Titchener, E. B., 'A Text-Book of Psychology' (2 vols., 1909–10).

PERCEVAL, pĕr'sĭ-vạl, **Spencer, Rt. Hon.,** English politician: b. London, England, 1 Nov. 1762; d. there, 11 May 1812. He received his early education at Harrow and was graduated from Trinity College, Cambridge, in 1781. He studied law, was admitted to the bar and rose rapidly in his profession, attaining a high reputation as a constitutional lawyer. In 1794 Lord Chatham made him counsel to the Board of Admiralty. In 1795, Pitt offered him the Chief Secretaryship for Ireland but he candidly declined it. In 1796 with the aid of Pitt he was returned to Parliament for Northampton and there proved himself an eloquent speaker and a quick and keen debater. In 1801 he was solicitor-general, in 1802 attorney-general. On the decease of Cox in 1807, he was appointed chancellor of the exchequer, in which office he continued until 1809 when, upon the death of the Duke of Portland, he succeeded him as First Lord of the Treasury and became Premier. This office he held until his assassination at the door of the House of Commons by a man named Bellingham, who declared that he had slain him by mistake for Lord Leverich Gower, with whom he had a grievance. Consult Williams, 'Life and Administration of the Right Honorable Spencer Perceval' (1856); Walpole, 'Life of Spencer Perceval' (1874).

PERCH, a popular name, used with some specific qualifying word for a variety of spiny-rayed fishes; but generally and properly applied to species of the genus *Perca* of which about 90 species are known, most of them American. The name «white perch» is erroneously but commonly given to *Morone interrupta* described below. These fishes belong to the families *Percidæ* and *Serranidæ* respectively. The yellow perch (*Perca flavescens*), known in many localities as «yellow Ned,» ringed perch, etc., is very closely related to the *Perca fluviatilis* of Europe, with which many zoologists consider it to be identical. It may be recognized by the possession of two spines before the anal fin, the well developed pseudo-branchiæ, the absence of canine teeth on the vomer and jaws and the distinctive colors, which are olivaceous above, golden yellow with six or eight dark vertical bands on the sides and the pectoral and ventral fins orange or red. It reaches a length of one foot and a weight of two pounds, but generally does not exceed one pound. This well-known and deservedly popular fish abounds in the fresh waters of the eastern United States, descending coastwise streams to the brackish waters of bays and inlets, in which it attains a large size and excellent quality. It is especially abundant in the Great Lakes and is common in the lakes and streams of the upper Mississippi Valley; but is not found in the lower Mississippi and its tributaries, nor on the Atlantic Coast south of North Carolina. Recently it has been introduced, through the United States Fish Commission, in western lakes and streams from which it was formerly absent. The yellow perch prefers slow-running streams, ponds or lakes with sandy or gravelly bottoms; and is to be sought in the deeper holes under shaded banks, about mill-dams, bridge-piers, sunken timbers and in eddies. It is gregarious and a noteworthy circumstance is that each school is composed of fish all of one size — be they large or small. Like several other fresh-water fishes they become inactive in very cold weather and conceal themselves in holes. In the spring they assume brighter hues, the reddish parts becoming deeper in tint as the spawning season approaches. The eggs are about 1/12 inch in diameter, and are remarkable for their adhesive quality and the manner of deposition in strings or bands which sometimes reach a length of seven feet, and a width of three or four inches. They are laid from February to May, according to locality. The favorite food of this fish consists of minnows and other small fishes, which they pursue with relentless vigor; but they also eat many kinds of worms, insects and their larvæ, etc. Though not of superior quality yellow perch is esteemed as a panfish and is shipped to the principal markets to an annual value of several hundred thousand dollars. The principal fisheries are on several of the eastern rivers, and especially the Great Lakes, where they are taken in large numbers in various kinds of traps and set-nets.

The white perch (*Morone americana*) belongs to the family of the sea-basses and rockfish (*Serranidæ*). It has three spines before the anal fin, and the two dorsal fins are united, with very strong spines in the anterior. The color is olivaceous above, silvery white on the sides and belly, marked with faint longitudinal streaks. In length it is usually about nine inches and its weight is about half a pound. A few specimens weighing up to two pounds have been caught in Connecticut waters. This species is exceedingly abundant along the coast from Nova Scotia to South Carolina, in the brackish and fresh waters of estuaries and rivers, and is found landlocked or introduced in many fresh-water ponds. It appears to be somewhat migratory, the schools remaining in brackish water during the winter and ascending the rivers in the spring. They usually spawn about May — about 40,000 small, clear, semi-buoyant and separate eggs being deposited by each female on regular spawning grounds. Their food resembles that of the yellow perch, but they show a preference for shrimps and other crustaceans.

Both of these perches are favorites with anglers and may be caught with live bait and the simplest of tackle; but the finest sport is afforded by the use of a trout rig with either bait or artificial fly. (See also PIKE-PERCH). Consult Goode, 'American Fishes' (New York 1888); Henshall, 'Bass, Pike, Perch and Others' (New York 1903).

PERCH, POLE, or **ROD,** a measure of length used in surveying land, equal to 5½ yards or 16½ feet. Surveyor's chains are usually four perches or 66 feet in length. A square perch is 30¼ square yards, and 160 square perches make an acre. In masonry a perch is a cubic measure, signifying a form 16½ feet long, 1½ feet high, and 1 foot thick. It contains 24¾ cubic feet.

PERCHED BOWLDERS. See ROCKING STONES.

PERCHERON (pĕr-shē-rôṅ) **HORSE,** a breed of heavy horses perfected in the province of La Perche, in northcentral France, a long time ago. They were first brought to America in 1839. It has Arabian characteristics imparted to a large, bony frame, giving a very strong and durable draught-horse, rarely less than 15, and often 16 hands high, and weighing from 1,500 to 2,000 pounds. Many stallions of this breed have been imported into the United States, and have influenced favorably the work-horses of the country. As the heavier type was desired to mate with the light-weight mares of this country a heavy draught horse has been the development here whereas in Europe a heavy coach horse was developed. The Percherons in America make excellent farm horses of quick, alert action and great strength. They are stocky and easy keepers, and of great endurance. There are said to be over 30,000 registered Percherons in the United States.

PERCHLORIC ACID and **PERCHLORATES.** Perchloric acid, $HClO_4$, is prepared by the careful distillation of a mixture of powdered potassium perchlorate and four times its weight of concentrated sulphuric acid; the product being purified by repeated distillation in a vacuum. The water-free acid is a heavy, colorless, syrupy liquid, specific gravity 1.8 soluble in water with evolution of heat, can be distilled without decomposition at 102° F. under diminished pressure. At a temperature of 230° white fumes are evolved and pure perchloric acid comes over. By continuing the distillation the liquid gradually becomes a white crystalline mass. It unites with the moisture of the air emitting dense white fumes of the hydrate, $HClO_4.H_2O$. This hydrate when heated decomposes into pure acid which distils over, and an aqueous acid which boils at 203° and is left behind in the retort. It is a strong monobasic acid resembling sulphuric acid in many of its physical and chemical properties. Iodine dissolves in it, producing a yellow crystalline substance, with the formula HI_7O_8. If distilled at a low pressure perchloric acid assumes a brownish color, similar to bromine, and explodes. It is also very apt to decompose with explosive violence when brought in contact with anything of an organic nature as paper, wood, charcoal, etc. Burns on skin produce wounds which do not heal for months. It forms a number of salts, the most important being potassium perchlorate and sodium perchlorate. Potassium perchlorate is made by the careful application of heat to potassium chlorate which decomposes, giving off oxygen and a mixture of potassium perchlorate and potassium chloride. It is then dried, powdered, well washed and heated gently with hydrochloric acid as long as chlorine and chlorine peroxide are evolved; and again washed. It is a colorless crystalline body, rather difficultly soluble in water, and differs markedly from the free acid in being very stable, decomposing only at a high temperature to oxygen and potassium chloride. Perchlorate of soda is found in small quantities in Chili-nitrate.

PERCIER, pār-sē-ā, **Charles,** French architect: b. Paris, 22 Aug. 1764; d. there, 5 Sept. 1838. He was a pupil of A. F. Peyre, in 1786, won the *premier grand prix de Rome,* during the Revolution designed furniture and decorations and by the antique motifs which he introduced from Pompeii and Rome, may be said to have begun the «Empire style» so widespread in Europe in the early 19th century. From 1794 to 1814 he worked in collaboration with Pierre Fontaine (q.v.), with whom he continued the decoration of the Paris Opera, restored the Louvre colonnade and completed the upper story of the buildings about the court, built the theatre and chapel of the Tuileries, and designed the Arc de Triomphe du Carrousel, and the grand staircase of the Museum. Napoleon made him a chevalier of the empire. Among his writings are 'Restauration de la Colonne Trajane' (1788), and 'Choix des Plus Célèbres Maisons de Plaisance de Rome et de ses Environs' (1809–13).

PERCIN, Alexandre, French general: b. Nancy, 1846. He served in the Franco-Prussian War 1870–71, and attained the rank of captain. He became brigadier-general in 1900 and major-general in 1903. In 1893 he was appointed director of the Saint-Etienne arms factory and was made a member of the Superior Council of War in 1908. In the first weeks of the European War General Percin held a prominent command, but was retired by General Joffre for reasons which were not made public. He was a frequent contributor to periodical literature on military subjects.

PERCIVAL, James Gates, American poet and geologist: b. Kensington, Conn., 15 Sept. 1795; d. Hazel Green, Wis., 2 May 1856. He was the second of three sons of Dr. James Percival. At the age of 16 he entered Yale College; when 20 he stood at the head of his class, which included the poet John G. Brainard, statesmen John M. Clayton and Thomas A. Marshall, and author Rev. Wm. Buel Sprague, and was graduated as bachelor of arts June 1815. He early showed a strong predilection for the writing of verse, but devoted himself to the study of medicine also. At the age of 25 he published his first volume of poems. Then, having received the degree M.D., and being in feeble health, he went to Charleston, S. C., where he began to publish a periodical entitled *Clio,* which failed after two issues. He gave this name later to one of his books of verse. In the year 1824 he was appointed professor of chemistry at West Point and was also appointed United States physician there. He resigned after a few months. He never again attempted to follow the practice of medicine, but continued to write verse and studied assiduously in geology and the allied physical sciences. During the year 1825 he published a second volume of poems, which was republished in London. After leaving West Point he drifted about and soon became assistant of Noah Webster in publishing 'Webster's Dictionary,' in which his knowledge of many languages proved invaluable. Having been appointed assistant State geologist of Connecticut, in 1836, he continued in that capacity until the year 1842, when he issued an elaborate report on the work of his department. The next 10 years of his life were passed in poverty and ill health. In 1853 he was employed by the American Mining Company to examine into and report upon its mines in Wisconsin. After he had finished that work in 1854 he was appointed by Governor Barstow State geologist for Wisconsin, which place he filled until his death, having made one report, and died during the time he was preparing his second. Percival was a linguist and scholar and wrote poems in Danish, German, Italian, Latin and Greek. As a geologist he ranked with Hitchcock and Comstock as the foremost of their time. He translated from the French, Malta Brun's Geography, published in 1843. In religion he was a Universalist; in politics, an Abolitionist. All his poems show an artistic finish, and several of them are entitled to a high place among the classic literature of the English language. His 'The Deserted Wife' has run through school-readers and has been recited upon many a rostrum. 'Prometheus' was his greatest effort, and, no doubt, one of the best of all his works.

PERCUSSION, in medical technics, that method of investigation which consists in tapping on the surface of the body, to ascertain from the sound produced the condition of the parts lying beneath. It forms a principal branch of modern medical diagnosis. Anatomy teaches how the organs enclosed in the cavities of the body are normally formed, whether they are firm or spongy in texture, whether they are full or empty of air, whether they are tense or lax, etc.; and, according to these distinctions, a slight blow upon the surface over them will evoke variations of sound, dull where the underlying substance is solid; resonant where it is more or less hollow. Thence by a comparison of the sounds emitted on percussion with the information furnished by physiology as to the position and structure of any particular organ, and by pathology as to the morbid changes to which it is liable, an idea more or less distinct is obtained of the actual condition of the organ and of the nature and extent of any disease which may be acting upon it. In a technical point of view percussion is either immediate or mediate. In the former a stroke is given with the ends of the fingers on the part of the body, either bare or slightly covered, which is to be examined; in the latter an intermediate substance, as a firm elastic plate or body of ivory, wood, gutta-percha, etc., called a pleximeter, is placed on the part in question, and the stroke is given on it either with the fingers or with a percussion-hammer. As ordinarily practised, one or two fingers of the left hand are laid firmly against the part, and sharp raps are made with the end of the middle finger of the right hand. Much depends on the way in which the stroke is given, as its force and elasticity, as well as its direction, have much influence on the sound. It was introduced in 1761 by the Vienna physician, Auenbrugger (q.v.). Ignored by the profession in Austria, it was brought again into notice by its advocacy by Corvisart in 1808. The practice of it has extended throughout the medical world. Mediate percussion was invented by Piorry in 1828, and it has been carried to the highest perfection by Skoda and his pupils. See AUSCULTATION.

PERCY, an ancient and noble English family, of Norman or Danish extraction, tracing their descent from Manfred, who settled, before Rollo came to France, at Perci, near Villedieu. Its founder in England was William de Percy, called «Alsgernons» or «Algernon,» «the mustachioed,» who came over with William I in 1066 (or 1067) and received lands in Yorkshire, where he resided, and in Lincolnshire, Essex and Hampshire. His son Alan succeeded him in 1116, as 2d Baron Percy. Alan's son William became 3d Baron Percy in 1168, and died without male issue, but Joscelin of Louvain, upon his marriage with William's sister, Agnes de Percy, took the family name and the title of 4th Baron. His son Richard (about 1170–1244) signed the Magna Charta. Their direct descendant in the 6th generation was Henry Percy (1342–1408), 1st Earl of Northumberland, who rebelled against Richard II, and then, with Henry IV, was defeated at Shrewsbury (1403), where his son Henry Percy, called «Hotspur,» was killed, 21 July 1403, and at Bramham Moor, where he was slain (1408). Hotspur's son Henry (3 Feb. 1394–23 May 1455), 2d Earl of Northumberland, served often as special ambassador and at length became lord high constable, and fell on the Lancastrian side at Saint Albans. Six years later the 3d earl, again named Henry Percy (25 July 1421–29 March 1461), died in battle at Towton, where he was defeated by the Yorkists. The 4th Earl Henry (1446–28 April 1489) was killed in a popular uprising directed against him. His son Henry Algernon (13 Jan. 1478–19 May 1527), 5th Earl of Northumberland, served under Henry VII and Henry VIII, holding important offices and escaping from the jealousy of Wolsey. His son of the same name, the 6th earl (1502–29 June 1537), had no children, made the king his heir. The title went to his nephew Thomas, 7th Earl of Northumberland (1528–72), a Catholic, whose religion made him distasteful to Elizabeth. He joined Westmoreland in behalf of Mary Queen of Scots, rebelled openly in 1570, and was beheaded at York 22 Aug. 1572. He was succeeded in the title by his brother Henry (1532–21 June 1585), was devoted to Elizabeth, assisted in suppressing the Catholic rising led by his brother, but after his execution followed his example, declared for Mary, was seized, tried for treason, fined and released, only to be arrested a second and a third time, being sent to the Tower in 1584. There he was mysteriously shot through the heart, probably by his own hand. His son Henry (1564–5 Nov. 1632) was accused of complicity in the Gunpowder Plot and was imprisoned for nearly 16 years (1605–21) in the Tower, where he devoted himself to the sciences. His kinsman Thomas Percy, the actual organizer of the Gunpowder Plot, b. 1560; d. Holbeach, 10 Nov. 1605, was educated a Protestant, but became an ardent Catholic, hired a house adjoining the Parliament house in his own name, put Guy Fawkes in charge and stored gunpowder in the adjoining cellar, intending to destroy the members at the next session. His plot was discovered and he escaped from London, but was pursued by government troops and in the ensuing fight was mortally wounded. The 10th Earl of Northumberland, Algernon Percy (October 1602–13 Oct. 1668), was the third great earl. He was appointed 23 March 1636, admiral of the fleet, in which position he attempted in vain to reform the navy under Charles I; sided with the opposition in the Long Parliament, but was in favor of peace throughout the civil war and took no part in public affairs during the Commonwealth; and advanced the cause of the Restoration. His son Josceline (4 July 1644–21 May 1670) was survived by a daughter, later the Duchess of Somerset, whose son became Duke of Northumberland. Consult De Fonblanque, E. B., ‘Annals of the House of Percy’ (London 1887).

PERCY, Florence, the pen name of Elizabeth Akers Allen (q.v.).

PERCY, George, English colonial governor: b. Northumberland, England, 4 Sept. 1580; d. England, March 1632. He entered the army, served in the Netherland wars and in 1600 came to America where in 1609 he succeeded Capt. John Smith as governor of Virginia, retaining the office until Sir Thomas Gates arrived from England in 1610, when he became a member of the governor's council. From March 1611 to May 1612 he acted as deputy governor and in 1612 returned to England where he again served in the wars in the Low Countries in 1625, becoming captain in 1627. He was a man of much courage as a soldier and showed ability in administering the affairs of the colony when in his charge. He wrote ‘Discourse of the Plantations of the Southerne Colonie in Virginia’ (1606); and ‘A Trewe Relaycion of the Proceedings and Occurentes of momente . . . in Virginia . . . 1609–1612’ (1625).

PERCY, Thomas, English prelate and antiquary: b. Bridgenorth, Shropshire, 13 April 1729; d. Dromore, Ireland, 30 Sept. 1811. He was graduated at Oxford in 1750, taking his M.A. in 1753, and after taking orders in the English Church was vicar of Easton Maudit, Northamptonshire, 1753–78. He proceeded to the degree of D.D. in 1770 from Emmanuel College, Cambridge. In 1778 he became dean of Carlisle, which he resigned in 1782 for the Irish bishopric of Dromore. The last five years of his life he was blind. He is best remembered by his ‘Reliques of Ancient English Poetry’; and a poem, the ‘Hermit of Warkworth.’ Many of the pieces in the ‘Reliques’ were retouched, recast and, when fragmentary, completed, almost always with great taste. The work was published in 1765 and materially helped to give a more natural and vigorous tone to English literature. The manuscript source of Percy's ‘Reliques’ was edited and published by J. W. Hales and F. J. Furnivall in 1867–68. Percy was well skilled in the Icelandic and several other languages and he made some translations from Portuguese versions of Chinese works. He also published a curious domestic record, long extant in the Percy family of Northumberland, with which he claimed a dubious kinship, and known as the ‘Northumberland Household Book’— a document valuable for the light it throws on the manners of a bygone age. (See RELIQUES OF ANCIENT ENGLISH POETRY). Consult Gaussen, A. C. C., ‘Percy: Prelate and Poet’ (1908).

PERCY ANECDOTES, a collection of popular anecdotes published in monthly parts (1821–23). They were assumed to be from the pens of «Sholto and Reuben Percy, Brothers of the Benedictine Monastery of Mount Benger.» The real names of the authors were Thomas Byerley (d. 1826), first editor of the ‘Mirror of Literature,’ and Joseph Clinton Robertson (d. 1852), editor of the *Mechanics' Magazine.* The Percy coffee-house in Rathbone place, London, was the customary place of meeting of Byerley and Timbs, and the series derived its name from this circumstance. A new edition of the ‘Percy Anecdotes,’ edited by Timbs in four volumes appeared at London in 1887.

PERDICCAS, pėr-dĭk'ạs, Macedonian general: d. near Memphis, Egypt, 321 B.C. He was descended from the royal house of Orestis, a Macedonian province, attached himself to the court of Philip and was a member of that ruler's bodyguard at the time of his assassination. He fought in all the important campaigns of Alexander, and for his services at Susa received a crown of gold and the daughter of a satrap of Media for his wife. At Alexander's death Perdiccas received from him his signet ring, the symbol of royal power, and was placed in command of the military forces by the new sovereign Arrhidæus, the natural son of Philip, over whom he soon gained a paramount influence, practically controlling the government. War was at length declared against him by Antipater, Craterus and Ptolemy. Perdiccas thereupon marched into Egypt to meet Ptolemy and was slain by his own soldiers.

PERDIDO, pėr-dĭ'dō (Sp. pĕr-thē-thō), a river and bay which form the western boundary of Florida, separating it from Alabama. The river rises in southwestern Alabama and flows south into the bay. The bay is entirely landlocked and its outlet into the Gulf of Mexico is so small, and enters at so acute an angle with the line of coast, as to be almost undistinguishable from sea, from which circumstance the river and bay probably derived their Spanish word name *perdido,* or «lost.» There are generally but four or five feet of water on the bar at its mouth. The river and bay were from an early period the boundary between the French colony of Louisiana and the Spanish colony of Florida, and were claimed as the eastern boundary of the territory acquired by the United States by the Louisiana purchase in 1803. The question was not settled till the cession of West Florida to the United States in 1819.

PÈRE GORIOT, pãr gō'rē-ō. ‘Père Goriot’ (1834), probably best of the «Parisian Scenes» in the ‘Comédie humaine’ by Honoré de Balzac, is the counterfoil of ‘Eugénie Grandet.’ There avarice crushed paternal affection; here the too-loving father — a bourgeois Lear — is made the victim of his daughters' folly and insatiate social ambition. The story, like many even of the best of Balzac's, lacks unity. Interest is divided between the tragedy of Goriot's unrequited paternal devotion, the social climbing of Rastignac, and the personality of the super-criminal Vautrin, both of whom play leading parts in other scenes of the Comédie Humaine. So far as it concerns Goriot the story is in outline this: He had amassed a considerable fortune as a speculator in food and as a politician in Revolutionary days, had divided it between his daughters, spoiled children, who had married beyond their station, Anastasie the Count de Restaud, Delphine the Alsatian Nucingen, a wealthy banker, of whom they neither had the love nor deserved the respect. Their follies for worthless lovers brought both into repeated financial crises from which they were partly extricated by the father's unreckoning sacrifice. Seeking to secure their happiness by the gratification of their desires, he completes his own ruin without averting theirs. Already fatally compromised, they shine at a ball while their father is dying, and are constrained to leave him to the barest of funerals at the charge of a medical student and Rastignac. A fierce quarrel of the daughters over the fainting Goriot, and his death, following hard upon it, are described with great power. Notable, too, are the pages in which the ex-convict and satanic philosopher of cynical self-will Jacques Collin, alias Vautrin, beguiles Rastignac to crime. The progressive corruption of this brilliant youth, under Vautrin's promptings and the exigencies of his relations with Delphine, is admirably exhibited. Much of the action takes place in a Parisian boarding-house, precisely located in the Rue Neuve-Sainte Geneviève, «between the Latin Quarter and the Faubourg-Saint-Marcel,» the famous Pension Vauquer, described with really marvelous minuteness of vision in the opening pages. Here lived and died Père Goriot, in a room as minutely depicted. Every boarder is made a portrait-study, notably the young and beautiful Victorine Taillefer. The landlady, the porter, the maid are no less individualized. In and above the social circle of Anastasie and Delphine, the Vicomtesse de Beauséant and the Duchess de Langleais are engaging figures. Indeed few novels count so many life-like character studies, though all of them pale before the picture of the tortured heart of Goriot, drawn as it were in blood, and of Rastignac, with high breeding and slender purse, cast to sink or swim in an unfamiliar world. Vautrin, though less real, lives, like his fellow-superman and convict, Hugo's Jean Valjean, by the sheer creative power of genius. How society dominates at last even the giants who contravene its laws remained to be shown in 'Lost Illusions,' 'The Splendors and Miseries of Courtesans' and 'The Last Incarnation of Vautrin.' The later fortunes of Anastasie may be followed in 'Gobseck' and 'The Beauvisage Family'; of Delphine in many stories notably 'The Deputy from Arcis.' Rastignac has a subordinate part in many novels, among them 'Lost Illusions,' 'The House of Nucingen' and 'Cousine Bette.' It is enough for 'Père Goriot' to have given senile paternal devotion and self-centred filial ingratitude probably their strongest expression in all fiction. There is a good translation in 'Everyman's Library.'

Benjamin W. Wells.

PÉRE LACHAISE, pār-lạ'shāz', a cemetery on the northeast side of Paris and one of the most remarkable burial grounds in the world. Its site was the garden of the country villa bestowed on François d'Aix de Lachaise, confessor of Louis XIV, by that monarch. It was converted to its present use in 1804 and now contains over 20,000 monuments and nearly 800,000 graves. Some of the great figures in French modern history repose within its precincts. Here, too, is the celebrated monument to Oscar Wilde.

PEREDA, pā-rā'thā, **José Maria de**, Spanish novelist: b. Polanco (Santander), 6 Feb. 1833; d. there, 1 March 1906. He received a good education, was graduated as an engineer, but soon found that his talents and inclinations lay in the direction of literature. As he possessed independent means, he determined to satisfy his preference in this respect. His early work brought him little recognition because it confined itself to the description of local scenes and characters until then practically unknown beyond their local domain. Yet his 'Escenas Montañesas' (1864) and other like works are clever in presentation, excellent in diction and original in form and presentation. Among his other publications worthy of special notice are 'Bocetos al Temple' (1876); 'Tipos' (1877); 'El buey suelto' (1877); 'Don Gonzalo Gonzalez de la Gonzalera' (1878); 'Pedro Sanchez' (1883); 'Sotileza' (1884); 'La Montalvez' (1888); 'La Puchera' (1889); 'Nubes de Estio' (1891); 'Al primer vuelto' (1891); 'Penas arriba' (1895); 'Pachin Gonzalez' (1895). Pereda, though not a very cosmopolitan writer, shows a great deal of originality in the handling of his subjects, plots and characters. His personages are for the most part local, but instinct with life and truth. An exception must be made in the case of his villians which are invariably over-drawn, often to such an extent that they appear caricatures. His language is strong and good and has great skill in the depicting of nature. See Pedro Sanchez.

PEREGRINUS, Petrus, otherwise Pierre de Maricourt, writer of the earliest treatise on the magnet, A.D. 1269. He owes his surname to the village of Maricourt in Picardy and the appellation Peregrinus, or Pilgrim, to his having visited the Holy Land. Little is known of his life save that he was a man of academic culture and a leader in experimental philosophy, that he was greatly admired by his contemporary, Friar Bacon, and that he served in the engineering corps of the French army which laid siege to Lucera in southern Italy in 1269. It was in the midst of his warlike duties at Lucera that Peregrinus sought to construct a motor which would keep the orrery of Archimedes in continuous rotation for a definite time; and in the course of this work, he was led to the consideration of perpetual motion itself with the result that he showed diagrammatically and to his own satisfaction how a wheel might be kept in movement forever by magnetic attraction.

To explain this magnetic motor, the first of its kind the world had ever heard of, Peregrinus wrote a letter of 3,500 words — the 'Epistola ad Sigerum' — from the trenches at Lucera to one Sigerus, a friend of his at home, in which he expounds clearly and methodically the properties of the magnet, many of which he himself had discovered. The letter is one of great interest in physics, geodesy and navigation. In it Peregrinus assigns a definite position to the poles (he uses the term) of a lodestone, and shows how to determine which is north and which south; proves that unlike poles attract and similar ones repel each other; breaks a magnet into pieces and finds that each fragment, however small, is a complete magnet; recognizes that a pole of a magnet may neutralize a weaker one of the same kind and even reverse its polarity; and crowns his work by supporting his magnets on a pivoted axis instead of floating them on corks or in glass vessels, as previously done, and by surrounding them with graduated circles; all this 50 years before Flavio Gioia of Amalfi invented his form of the mariner's compass which brought him fame.

Of manuscript copies of the 'Epistola,' the Bodleian library has six; the Vatican two; Trinity College, Dublin, one; the Bibliothèque Nationale, Paris, one; Leyden, Geneva and Turin, one each.

The first printed edition came from the presses of Augsburg in 1558, having been prepared by Achilles Gasser, a physician of Lindau who was well versed in mathematics, astronomy, history and philosophy. Libri published another in his 'Histoire des Sciences Mathématiques en Italie,' (1838), as did Bertelli in the 'Bulletino di Bibliografia e di Storia delle Scienze Mathematiche et Fisiche' (1868) and Hellmann in his 'Rara Magnetica' (1898).

Bertelli not only gives the Latin text, but collates and compares the readings of the Vatican codices with other manuscripts, adding copious references, critical remarks, etc.

Of translations, we have one by Prof. Silvanus P. Thompson (London 1902), and another by Brother Arnold of Manhattan College (New York 1904).

PEREIRA DA SILVA, dä sĕl'vä, **Joao Manuel,** Brazilian historian: b. Rio de Janeiro, Brazil, 30 Aug. 1817; d. 1898. He was educated in Brazil and in Paris, admitted to the bar of Rio Janeiro in 1814 and practised law successfully. In 1844 he was elected to Congress, where his course was conservative. As a historian he gained a wide reputation; among his works are 'Historia da fundação do imperio Brazileiro' (1864–68); 'Plutarcho Brazileiro' (1866); 'Obras politicas e literarias' (1868), etc.

PEREIRE, pā-rār, **Jacques Emile** (b. Bordeaux, 3 Dec. 1800; d. Paris, 6 Jan. 1875); **Isaac** (b. Bordeaux, 25 Nov. 1806; d. 12 July 1880), French bankers. They gained an immense fortune through the organization of the Paris and Saint Germain Railroad and afterward engaged in vast speculations. They founded the Société du Crédit Mobilier in 1852 (see CREDIT MOBILIER), and upon its becoming bankrupt contributed $16,000,000 to aid its reorganization. They greatly built up trade between France and America and through their efforts lines were established to South America, Mexico and the West Indies. They were the founders of a maritime company in 1855 which subsequently became the Campagnie Générale Transatlantique.

PEREIRA, Jonathan, English pharmacologist: b. Shoreditch, London, 22 May 1804; d. 20 Jan. 1853. He studied medicine and in 1823 was appointed resident medical officer of the general dispensary in Aldersgate street; afterward becoming lecturer on chemistry. In 1824 he published a translation of the 'London Pharmacopœia,' followed by 'A Manual for the Use of Students'; 'A General Table of Atomic Numbers, with an Introduction to the Atomic Theory,' and other textbooks. In 1832 he resigned the office of lecturer for that of professor of materia medica in the New Medical School in Aldersgate street, and succeeded Dr. Gordon as lecturer on chemistry at the London Hospital. His great work, 'Elements of Materia Medica,' appeared as a separate work in 1839–40, and at once established his reputation. The treatise is remarkable for research, variety of scientific, commercial and practical information, and scrupulous exactness. In 1841 he procured the license to practice in London from the College of Physicians and in 1845 was elected a fellow of that body, and on the establishment of London University he was appointed examiner in materia medica and pharmacy. Among his contributions to science, his excellent treatises on 'Diet' and on 'Polarized Light' (1843) are best known. His death was the result of a fall.

PÉREZ, Antonio, Spanish writer: b. Monreal de Ariza (Aragón), 1539; d. Paris, 3 Nov. 1611. He was at once a statesman of note in his day and he held a high place among the best letter writers of his age. A natural son of Gonzalo Pérez, Minister to Charles V and Philip II, he early obtained through his family connection and his own intelligence and talent strong influence at court, where he became secretary to the latter sovereign. He was peculiarly fitted for this position, having received the best education possible in his day at Madrid, Venice and Louvain. As the trusted agent of the king in almost every important political move, Pérez played a very prominent part in the politics of Europe, in their relation to those of Spain, for several years. In this connection he was mixed up in several unsavory acts, among them the murder of Juan de Escobedo, the special ambassador at the Spanish court of Don Juan of Austria (1578). In all of these moves he undoubtedly acted with the consent, if not at the solicitation, of the king. These acts raised up for him many enemies, among the bitterest and most persistent of whom were the relatives of Escobedo. At first the king loyally backed his secretary and agent; but Pérez made the mistake of playing false to his master; and the latter became his unrelenting enemy. Pérez fled from the Spanish Court to Aragon and, on the fall of the latter, he went to Paris and, later on, from there to London, then back again to Paris. Pérez had the ability to present his thoughts in a novel and interesing form. His «revelations» are to-day among the most unblushing confessions of an unblushing age. They are, therefore, of great interest in that they present a picture of the intrigues, corruptions, vices and love affairs of the court of Philip II and depict the sovereign himself and those surrounding him. His two most interesting remains are his 'Relaciones' and his 'Memorial del hecho de su causa.' The former which recounts at length his experiences was published in London in 1594. Consult Froude, J. A., 'Spanish Story of the Armada'

(New York 1892); Hume, M. A. S., ‘Antonio Pérez in Exile’ (‘Transactions,’ Royal Historical Society, London 1894); ‘Españoles é Inglesés’ (Madrid 1903); Miguel, A. M., ‘Antonio Pérez et Philippe III’ (Paris 1845); Muro, ‘Vida de la Princesa de Eboli’ (Madrid 1877); consult also Fitzmaurice-Kelley, ‘Spanish Literature’ (New York 1908); Ford, J. D. M. A., ‘A Spanish Anthology’ (New York 1901); Ticknor, M., ‘History of Spanish Literature’ (New York 1854).

PEREZ, pā'rĕts, **Isaac Loebush,** Jewish writer: b. Zamosc, Poland, 1851; d. 1915. He received the traditional Jewish training, after which he prosecuted secular studies. For many years he was a practising lawyer, but the restrictions imposed on members of his race obliged him to forego a legal career. He became secretary to the Jewish community at Warsaw and there he remained until his death. His first literary efforts were in Hebrew, but he soon abandoned this tongue in order to reach a larger audience through the Yiddish. His works are ‘Stories in Verse and Miscellaneous Poems’ (1877); ‘Love Poems’ (1894); ‘Collected Writings’ (1899–1901), in Hebrew. In Yiddish there appeared ‘Schriften’ (1906); ‘Folk Tales’ (1909); ‘Dramas’ (1910); ‘Adam and Eve’ (1910); ‘Chasidisch’ (1911); ‘Sketches and Pictures’ (1911); ‘For Young and Old’ (1911); ‘The Old and the New’ (1912). For an appreciation of Perez's influence on his audience consult Pinès, ‘Histoire de la littérature judéo-allemande’ (Paris 1910).

PÉREZ, pā'răth, **Pedros Ildefonso,** Mexican minor poet: b. Merida, Yucatan, 23 Jan. 1826; d. there, 21 Feb. 1869. He was self-educated, entered the employ of the government when very young, meanwhile continuing his study of literature, particularly the works of the Spanish poet Zorrilla. In 1849 he was one of the founders of the Academy of Science, and at his death was a member of the government council and comptroller of the treasury of his native state. His work was long in gaining recognition and the best of it was published in the literary journals *Mosáico* and *Pensamiento.* A collection of his poems was published in 1885. Among his works are ‘La Ida del Sol’; ‘A Tunkas’; ‘El Prisma de la Vida,’ etc.

PÉREZ GALDÓS, gạl-dōs', **Benito;** Spanish novelist and dramatist: b. Las Palmas, Canary Islands, 10 May 1845. He was graduated in law at Madrid but finally gave it up to devote his energies to painting, for which he displayed considerable talent. But the revolution found him contributing political, critical and literary articles to *El Parlamento* *La Nación, El Contemporaneo, La Revista de España* and other Madrid papers. In 1871 he published his first historical romance, ‘El Audaz,’ which was so favorably received by the public that he was enabled to find a publisher for ‘La Fontana de Oro,’ which had been written four years earlier. He found a mine of wealth in the stories, tales and incidents connected with the political and national struggles of Spain from the beginning of the 19th century on to his own time, and in 1873 he began the publication of ‘Episodios Nacionales,’ which resulted in 10 volumes covering the war for independence and the events that led up to it. These romances include ‘Trafalgar,’ ‘La corte de Carlos IV,’ ‘El 19 de Marzo y el 2 de Mayo,’ ‘Bailén,’ ‘Napoleón en Chamartlin,’ ‘La Batalla de los Arapiles,’ ‘Zaragoza,’ ‘Gerona,’ ‘Cádiz,’ ‘Juan Martín el Empecinado’ (1873–75). They became very popular and placed Pérez Galdós among the foremost Spanish literary men of his day. A second series of national romances followed in 10 volumes and became as popular as their predecessors. This latter series shows more maturity, better literary form and more centainty in the presenting of the artistic coupled with a broad sympathy for and a deep insight into human nature. It includes ‘El equipaje del Rey José,’ ‘Memorias de un cortesano de 1815,’ ‘La segunda casaca,’ ‘El Grande Oriente,’ ‘Siete de Julio,’ ‘Los cien mil hijos de San Luis,’ ‘El terror de 1824,’ ‘Un voluntario realista,’ ‘Los apostólicos,’ ‘Un faccioso más y algunos frailes menos.’ Slowly but surely Pérez Galdós was developing a mastery over his characters, his literary material and himself that was to place him in the very fore rank among the Spanish romantic writers of the 19th century. His studies of the history of the political and social struggles of Spain during the first half of the past century had shown him the bigotry and religious intolerance then characteristic of Spanish life, especially in the rural districts; and his own naturally liberal attitude toward political and religious questions had displayed itself frequently in the two series of ‘Episodios nacionales.’ So when he began, in 1876, the publication of the ‘Novelas españolas contemporaneas,’ he had insensibly drifted into a field where his genius found itself more at home than it had ever previously been. With a skill and enthusiasm surpassing the best displayed in his previous work, he set himself to depict national customs, habits, prejudices and modes of thought. He was the valiant knight of the crusading days going out after the bigotry of his own age. His pictures of Spanish society are instinct with life, virility and the compelling sense of their truthfulness. An earnestness and a power of describing feelings and passions pervade this whole series of ‘Novelas españoles contemporaneas’; so these new novels got closer to the heart of the Spanish people than any of his previous ones had done; and having a much broader and more general human interest, they soon made the author popular outside his own country. This popularity called for translations of practically all of the series of ‘Novelas contemporaneas’ into the various languages of Europe. Pérez Galdós thus soon found himself at the head of a school of his own, composed of uncompromising adherents and admirers among the younger literary set of Spain, behind whom stood the greater part of the novel reading class of the nation, who were captivated with his power of depicting most convincingly so many striking and interesting phases of the national life, and of drawing female characters with a skill surpassed by few, if any, Spanish writers. All Spain loves a good love story and Pérez Galdós presented it with love stories, the heroines of which seemed almost at once, after their appearance, a part of the national life. The peculiarly national yet realistic types thus presented in the midst of the bitterest satire on the narrowness of rural life, its self-complacency and its intolerable bigotry, tended to fix the national attention on his female characters which are generally the storm centre of a stormy plot and of intrigues which have made them the subjects of much and bitter discussion and the recipients of strange sympathy from the followers and friends of Pérez Galdós, who were legion in Republican and revolutionary Spain. His attacks on the bigotry of the Church and his ridicule of the priests brought the Catholic organizations about his ears; and this made the author himself a storm centre, the result of which was that the echo of the local conflict resounded in foreign countries; and the comparatively young author woke to find his works being studied by foreign literary societies and clubs and placed as school texts on the curriculums of colleges and universities wherever the language of Cervantes was studied. 'Gloria' and 'Doña Perfecta' became almost as well known abroad as in Spain. To the novels of this class, which may be called the third period of his literary activity, belong 'Marianela,' 'Doña Perfecta,' 'La familia de Leon Roch' (1878); 'Gloria' (1879); 'El amigo Manso' (1882); 'El doctor Centeno' (1883); 'La de Bringas' (1884); 'Tormento'; 'La prohibido'; 'Fortunata y Jacinta'; 'Miau'; 'La Incógnita'; 'Torquemada en la hoguera'; 'Realidad'; 'La desheredada'; 'Angel Guerra'; 'La Sombra'; 'Tristana.' In various other novels not here mentioned he has continued to work the veins of national customs, characters and incidents to the satisfaction of the Spanish reading public by whom he has been more or less idolized.

While Spain has, since the beginning of the present century been fairly unanimous in its according to Pérez Galdós the first place among Spanish novelists of the latter quarter of the 19th century, there still exists a very decided difference of opinion as to his merits as a dramatist. His dramas show much less marks of originality than his novels. Most of them in fact being dramatizations of his novels interspersed with an occasional original drama. Pérez Galdós began his dramatic career in 1892 with a dramatization of his successful novel 'Realidad.' This was followed by 'La Loca de la Casa' in 1893, and 'Gerona.' These all had a certain success which the fame of the author lent them, but nothing more. 'La de San Quintin' presented in 1894, was enthusiastically received because its dramatic construction is much better than the dramas that preceded it and because it is socialistic in the extreme in its denunciation of inherited wealth and position and oppression of the poor and the laboring classes. Among the other dramas of Pérez Galdós, several of which have been very successful, are 'Los Condenados'; 'Voluntad'; 'La fiere'; 'Electra'; Mariucha'; 'Bárbara'; 'Amor y ciencia'; 'Pedro Minio'; 'Casandra'; 'El abuelo'; and 'Doña Perfecta.' The Spanish critics have complained that Pérez Galdós' Spanish is by no means classical, and that even in his own finest descriptive passages, dialectic forms and grammatical improprieties are constantly creeping in. Yet in spite of these acknowledged shortcomings, he is head and shoulders above any other Spanish novelist of his own time. He has the wonderful power of observation of Scott, Dickens and Manzoni; and his voice is nearly always pitched in a true key. He makes breathe again for us the people of an age but recently past, an age like our own in that it was one of wonderful new ideas about which the passions of mankind fought and for which many bled and died; yet very different from our own in its attitude toward most of the questions that vitally affect human life. This great difference Pérez Galdós paints always with the truth and sympathy of a master hand. In his later novels and dramas he presents contemporary society, taking up in each some great national problem. New and modern ideas and the wall of prejudice and bigotry opposed to them form the great underground structure of most of his modern novels and dramas. He seems to be ever actuated by some impelling purpose, which never lets the interest of the story lag. His plots are well developed; he has a real genius for the creation of types, characters and costumes, and placing them always in appropriate situations. In the first two series of the 'Episodios' there are over 500 well-defined characters; and in the other two series published at a much later date, the power of creation is still with him. This power he owes in part at least to years spent in investigation in archives, libraries and among papers, documents, letters, biographies likely in any way to illustrate the history of Spain in the first half of the 19th century and, more especially, that of the French invasion. In pursuit of his work he studied the clothing, customs, advertisements, proclamations and laws of the period he wished to introduce into his story. His fascinating style, his brilliant descriptive power and his ability to group his scenes and characters with artistic effect around great national questions have enabled Pérez Galdós to make for himself a permanent place in Spanish literature. (See ELECTRA). Consult Alas (Clarín), 'Benito Pérez Galdós (Madrid 1889); Anthon del Olmet, 'Galdós' (Madrid 1912); Altamira, 'El Teatro de Pérez Galdós' (Madrid 1898); Menéndez y Pelayo, 'Discursos Académicos' (1898); 'Benito Pérez Galdós' (in preface to 'Episodios'); Pardo Bazán, 'Polemicos y estudios literarios' (Madrid 1892).

JOHN HUBERT CORNYN.

PÉREZ DE HITA, Ginés, Spanish poet: b. Murcia, and flourished in the second half of the 16th century. He took part in the war against the uprising of the Moor, which began in 1560. This much is known of his life from his 'Guerros Civiles de Granada,' which enjoyed a great reputation during the life of the author and for many years afterward, and which is still a valuable authority on the events of which it treats and the relations between Moors and Christians in Southern Spain down to the end of the 16th century. This work consists of two parts, one of which was published in Zarayoza in 1595, and the other in Barcelona in 1619. Both parts have been printed many times and generally issued in one volume. One of the best editions is that published in the 'Bibliotica de Autores Españoles' (Rivadeneira). This edition contains a valuable preface by Buenaventura Carlos Aribau (Vol. III). As poet Pérez de Hita does not stand very high; but as a simple, direct and effective historian his work is of great value. It has the added merit of seeing the troubles of Spain from the point of view of both contending factions; and he not infrequently lashes with unsparing hand the savagery and injustice of the Spaniards upon whom he blames much of the trouble. The two volumes of 'Guerras' are in reality distinct works since they treat of totally different events and personages in no way directly connected with one another. They are, moreover, distinct in subject and manner of treatment. The first volume is little else than a historical novel; while the second is history told very much in the form of a novel. Both are interesting and their stories are well presented from the point of view of the author; who is ever as ready to use his imagination as his labors and investigations in the realms of true history. The author writes like a soldier, and especially in the second volume the events that come under his attention either directly or indirectly through stories heard in camp, interest him more than direct and formal history adjusted to dates and official documents and developed in detail. These defects, in reality, at this distant date, make the 'Guerras' the more interesting and, in a sense, valuable, since they breathe the spirit and paint the customs of the age in which they were written. As the author unfolds his story we see the life of the camp and feel, in his tale, the breath that animated society when man's chief business was war and his greatest glory was gained from feats of arms. The 'Guerras' is filled with singular combats told in a spirited way that proclaims that the heart of the author was in his task; and the language of the text is singularly modern.

PÉREZ DE ZAMBRANA, dā săm-brä'nä, **Luisa**, Cuban poet and novelist: b. El Cobre, Cuba, 1837. She came of a very poor family, and spent her early days in the country, where she received a very meagre education. She read widely the Spanish poets, and early began to write poems which displayed depth of feeling and a fine sense of the rhythm of language. At the age of 14 she published, in the local press, 'Armor Materno' (Maternal Love), which attracted attention. This she followed with frequent contributions to the press, principally to *El Orden* of Santiago de Cuba, the following year. One of her poems, 'A Cuba,' became so popular that it was learned by the school children, and recited in public, in salon, school and theatre. At the age of 19 she published a volume of poems 'Poesias' which at once gained for her a national reputation. In 1858 Miss Pérez married Dr. Zambrana of Havana, a writer also of considerable reputation. Three years later Zambrana began the publication of *El Kaleidoscopio;* and for this his wife did some of her best work. Her poems were welcomed by the press of the capital and she contributed to the *Aguinaldo Habanero, La Havana,* the *Album de lo Bueno y lo Bello, Cuba Literaria, Revista Habanera, Brisas de Cuba, Ofrenda al Bezar, La Guirnalda* and *Noches Literarias*. In 1860 another volume of 'Poems' appeared with a critical yet laudatory preface, by Avellaneda, then at the height of popularity. This so increased her reputation that her poems were copied extensively in Spain and many of them were translated into Italian and French by eminent poets, all of whom found in the work of the young Cuban poet a new and compelling note of frankness, simplicity and wealth of poetic feeling. Among her admirers was the Italian poet Mantici who translated her 'Al campo,' 'Noches de luna,' 'El sabio en su patria,' and other poems into Italian; and Alexandre Aveline, who translated 'La caridad' into French. Among her novels and numerous other prose writings are 'Mujeres célebres,' 'Dolor,' 'A las estrellas,' 'Angélica,' 'Estrella' and 'Hija del verdugo.' To these must be added another book of poems issued in 1880, which still further increased her reputation at home and abroad. A vast amount of her writings is still buried in the files of the *Liceo Habanero, El Ateneo; El Siglo; Revista de Cuba, Album de las Damas*, and other periodicals to which she contributed in later years.

PERFECT NUMBER. See Arithmetic.

PERFECTABILISTS. See Religious Sects.

PERFECTIONISTS. See Noyes, John Humphrey; Oneida Community; Religious Sects.

PERFUMES (pėr'fūmz or pėr-fūmz') **and PERFUMERY.** Perfumes are substances of pleasing odor, prepared for use by combining them with inodorous materials, as grease, spirits, starch, soaps, snuffs. They are used in the extract form and in cosmetics, dentifrices, pastes, tinctures, incense, pastils, pomades, hair-oils, hair-washes and dyes, depilatories and other toilet accessories. They are classified as natural or artificial: the former being derived from animal and vegetable substances found in nature; the latter being produced synthetically by combining chemical substances.

Animal Perfumes.— There are four odors of animal origin used in perfumery — namely, musk, ambergris, civet and castor. The aroma of musk freely imparts odor to every body with which it is in contact. Its power is such that polished steel will become fragrant of it if the metal be shut in a box where there is musk, contact not being necessary. In perfumery manufacture tincture of musk is mixed with other odorous bodies to give permanence to the more evanescent perfumes or bouquets, the musk acting to them almost as a mordant does to a dyestuff. The usual statement as to the length of time that musk continues to give out odor is exaggerated. If fine musk be spread in thin layers upon any surface and fully exposed to a changing current of air, all fragrance, it is said, will be gone in from 6 to 12 months. The finest musk, that which indeed is the only kind really useful in perfumery, is distinguished as Tonquin musk, the average price of which is about $25 per ounce. Civet is exceedingly potent as an odor, and when pure, and smelled at in the bulk of an ounce or so, is utterly insupportable from its nauseousness; in this respect it exceeds musk. When, however, civet is highly diluted so as to afford but minute quantities to the olfactories, its sweet perfume is generally admitted; the fragrant principle is the same as that emitted by the beautiful narcissus, which also is too powerful for a great many persons. Civet is extensively used, when duly attenuated, in perfumery. Its powerful and lasting odor makes it very useful in soaps, and especially in sachets.

It is one of the perfumes of "Spanish leather," or Peau d'Espagne; the first gloves used in England were scented with it. Several thousand ounces are annually imported, the average price of which is about $3 per ounce. Castor, although it cannot be largely used in any given perfume on account of the very dark color of its tincture, when properly diluted is extensively employed. Its perfume, when old especially, is exceedingly pleasant, and its fixing power is at least equal to that of musk. Its market price is about $12 a pound.

Vegetable Perfumes.— The simplest perfumes and doubtless the most primitive are those exhaled by flowers dried for domestic use — rose petals, violets, lavender flowers, etc. — and combinations of these with fragrant spices and odorous woods and herbs. The fragrant gum-resins, in use from the most ancient times, exude naturally from the trees which yield them, or from wounds accidental or purposely inflicted to increase the yield. These may be regarded as perfumes in a solid form. The most important are benzoin, myrrh, opoponax, tolu, Peru and storax. A second group which are procured by distillation and are mostly fluid bodies are termed volatile oils, essential oils or ottos — formerly quintessences. Odor-bearing plants contain the fragrant principle in minute glands or sacs; these are found sometimes in the rind of the fruit, as the lemon and orange; in others it is in the leaves, as sage, mint and thyme; in wood, as rosewood and sandalwood; in the bark, as cassia and cinnamon; in seeds, as caraway and nutmeg; in yet others in the petals, as in rose, lavender or ylang-ylang. The odor principle of orris is a solid resembling cocoa-butter, and is contained in what is really the rhizome of *Iris florentina*, though techincally called orris-root. These glands or sacs of perfume may be plainly seen in a thin-cut stratum of orange-peel; so also in a bay leaf, if it be held up to the sunlight, all the oil-cells may be seen individually. All the fragrance-bearing substances yield by distillation an essential oil peculiar to each; thus is procured oil of patchouli from the leaves of the patchouli plant (*Pogostemon patchouli*), a native of Burma; oil of caraway, from the caraway-seed; oil of geranium, from the leaves of the *Pelargonium roseum;* oil of lemon, from lemon-peel, *Citrus limonis;* and a hundred others of infinite variety.

The celebrated perfumer Eugene Rimmel groups the scents mostly used in perfumery under 18 kinds, represented by the following types: rose, jasmine, orange-flower, tube-rose, violet, balsam, spice, clove, camphor, sandal, citrine, lavender, mint, aniseed, almond, musk, ambergris and vanilla. The first five mentioned, with acacia, are those most largely used in compounding the popular perfumes of the present day.

Manufacture of Natural Perfumes.— By the improvements introduced during the first half of the 19th century by Darcet, Leblanc, Robiquet and Chevreul, the perfume industry has developed rapidly and extensively. The reduction of the chemistry of essential oils to an exact science and the simplification of the machinery employed have done much for the industry, particularly in France. The preparation of all natural perfumes requires the exercise of the most delicate care. If, for example, the essence is contained in the flower, the perfume finally obtained will vary considerably with the age of the flower, with the atmospheric conditions at the time it was plucked and with the process of extraction employed. It may happen, therefore, that instead of the exquisite aroma which is exhaled by the growing plant, an odor is obtained totally lacking in delicacy. No little skill, experience and knowledge are required in the art of making perfumes. Nevertheless, certain general methods are employed which may here be briefly outlined. The process of infusion is employed for iris, musk, civet, benzoin and the like. The odorous substances are macerated with alcohol, thus forming tinctures. The process of expression is employed to a certain extent in the making of citron, orange and bergamot perfumes. The best essential oil is obtained simply by squeezing the peel with the hand. In Calabria, Italy, the expressed residue is afterward distilled with steam; but the essential oil thus extracted is of an inferior quality. The process most widely employed is that of distillation, which is resorted to for the extraction of essences that neither a high temperature nor aqueous vapor can appreciably decompose. Rosemary, thyme, ylang-ylang, roses, patchouli, lavender, cedarwood and sandalwood are thus treated. Long experience has shown that there are certain theoretical conditions which should obtain in practice. Among these conditions may be mentioned the picking apart of the flower to facilitate the diffusion of the essential oil; the treatment of proper quantities to obtain stronger products; distillation gradually increased in intensity by increasing the heat at the end of the process; the evacuation of the vapors with the utmost expedition; and quick condensation. The apparatus used for the purpose of attaining these objects varies in form almost infinitely. The use of fixed solvents depends upon the property which fatty substances have of absorbing perfumes when in contact with fragrant bodies. The cold process, absorption or *enfleurage,* as it is called by the French, is chiefly made use of for procuring the odoriferous principle of very delicate flowers, such as the jasmine and tuberose. Lard is the fat usually employed, although a mixture of beef fat with the lard is preferred for some perfumes. In the most approved apparatus the fat is laid out in "strings" on glass plates, with a fine syringe, and these plates are stacked in a tall case so that an air space is left alternately at front and back so that a current of air passing through the stack has to flow across every plate. The flowers are placed in bulk in a tall container and an air current forced through them passing thence through the stack with its larded plates. By careful adjustment of the size of the container and the stack, almost every bit of fragrance imparted to the air current is caught and held in the lard. The delicate perfumery oils are dissolved out of the fat with alcohol, chloroform, benzine, bisulphide of carbon, ether or petroleum spirit, according to the volatility of the oil obtained. The solvent is then evaporated by manipulation of the temperature with cold or heat. If the hot process is employed the flowers are encased in small bags of fine linen and hung in jars of fat which is kept melted by being immersed in warm baths or by hot-water jackets, into which the pots are fitted. The temperature is kept at from 100° to 120° F., for from 12 to 48 hours, according to the particular flowers being treated. In the larger establishments this operation is conducted in a continuous apparatus, formed of a series of fat-pots each containing a network basket filled with the flowers. A continuous current of melted lard flows through the apparatus in at the bottom of the pot and out of the top and thence into the bottom of the next in the series, and so on. New baskets of flowers are continually being fed into the apparatus, the newly-filled basket going into the last pot — that holding the lard which has the largest absorption of perfume. As each new basket is placed, all the others are moved up one place in a direction contrary to the flow of the lard. The flowers after passing through the series of pots are put into a hydraulic press and subjected to great pressure. This apparatus has been proved thoroughly effective. The fragrant oils are dissolved out of the lard by appropriate solvents, as already described, and the lard is ready to be used over again. Instead of fat, either glycerine or, as is usually the case, vaseline can be employed. In the manufacture of extracts the flowers are treated with alcohol until the essence is entirely removed. Rose water and similar perfumes are made by simply beating the fresh flowers in water: for rose water the proportion is five pints of water to each pound of rose petals. The heat is applied by steam pipes surrounding the bath and after the perfume is absorbed by the water, the whole is gently distilled, only the first half (two and one-half pints) being saved. Sufficient alcohol is added to keep it from molding. Oils of the citrus fruits — orange, lemon, bergamot, etc.— are secured by hand. The rinds of these fruits are cut into strips and removed from the fruit, being placed in water to soak for a short period. They are then squeezed against small sponges which take up the oil. These are afterward pressed out or dissolved out, according to the process used. As the quality of these oils is adversely affected by heat, they are distilled at a low temperature in a vacuum. Although most of the fragrant flowers which form the basis of natural perfumes are grown in the vicinity of Grasse, Cannes and Nice, nevertheless almost every quarter of the globe pays its floral tribute to the perfume makers of France. The distilleries of essential oils in the department of Alpes-Maritimes use annually 5,500,000 pounds of orange blossoms; 4,400,000 pounds of roses; 440,000 pounds of jasmine; 330,000 pounds of violets, and an equal quantity of cassia and tuberoses. In Basse-Alpes, Gard, Drôme, Hérault and Var 220,000 pounds of lavender essence; 88,000 pounds of thyme essence; 55,000 pounds of rosemary essence and the same quantity of aspic essence are annually manufactured. Furthermore, the environs of Algiers, Staouëli, the plain of Mitidja and Boufarik (Algeria), annually send to France a contingent of 13,300,000 pounds of rose geraniums and rosemary. Malaga supplies lavender, rosemary and thyme; Corsica, geranium; Dalmatia, lavender oil; Cyprus, the oils of myrtle and origanum; Mexico, the oil of linaloe; China, the oils of cassia and anise; Calabria, the oil of bergamot; Zanzibar, oil of cloves and other spice oils; Rumania, oil of fennel; Holland, oil of carraway; Tuscany, oil of orris; France, Spain and North Africa, oil of thyme; Burma, oil of lemon-grass; Asia Minor, oil of origanum and, since the war began, otto of roses, formerly supplied chiefly from Bulgaria, Uganga, oil of backhousia; Saint Thomas, West Indies, oil of bay; Paraguay, petitgrain oil; French Guiana, bois de rose femelle oil; Malay Archipelago, Java and the Philippines, ylang-ylang, patchouli and citronella; Mysore and Madras, oil of sandalwood. Natural perfumery oils are classified according to their chemical constitution, as follows:

Geraniol Group.— Otto of roses, the geranium oils of Turkey, France, Algeria, Spain and Italy (presenting minor differences); palmarosa oil, and the citronella oil of Ceylon.

Linalol Group.— Bois de rose femelle, linaloe, neroli, petitgrain, French lavender, English lavender, spike lavender, bergamot.

Eugenol Group.— Clove, cinnamon leaf, pimento, bay.

Anethol Group.— Star anise, fennel.

Saffrol Group.— Sassafras, camphor.

Thymol Group.— Origanum, thyme.

Aldehyde Group.— Java citronella, cinnamon (bark), cassia, lemon, orange, lime, citron, lemon-grass, backhousia, bitter almonds.

Ketone Group.— Carraway, dill, spearmint, pennyroyal.

Menthol Group.— Peppermint of Japan, peppermint of America, black peppermint of England, Italian peppermint.

Borneol Group.— Rosemary, pinus pumilio, pinus Sibirica.

Cineol Group.— Eucalyptus globulus, eucalyptus dumosa, cajaput.

Sesquiterpene Group.— Cubebs, juniper, patchouli, vetivert.

Unclassified.— Orris, wintergreen, sandalwood, ylang-ylang.

Manufacture of Artificial Perfumes.— The first synthetic perfumes were discovered by Cahours, Grimaux and Lauth in 1851; but the industry of artificial aromatic products hardly developed until the discovery of coumarin in 1868. The industry took its sudden rise after the remarkable synthesis of vanillin by Tiemann and Haarman in 1885, followed by heliotropin in the same year. By artificial perfumes French and German chemists usually mean compounds formed entirely from artificial substances and aromatic products obtained by the manipulation of natural essences. The methods of preparing artificial perfumes are of great theoretical simplicity; but in practice they are exceedingly difficult of application. Indeed, the principles underlying the preparation of artificial perfumes are by no means well understood. For alcohols, Haller has shown that succinct anhydrides are to be preferred. In the case of ether, the resultant alcohol is saponified and then re-etherized by means of an acid combined with the essential oil. The alkaline bisulphites are used in the treatment of aldehydes and ketones, which are separated from the compound formed by means of an acid or alkali. For the phenols, potassium is used and the salt obtained is decomposed by means of an acid.

Among the more important nitrated derivatives, the first place should be given to the artificial musk invented by Albert Baur in 1888. This ingenious German chemist prepares his substitute for the costly natural musk by heating a mixture of isobutyl chloride and tolune with aluminum chloride. Water is added to the product of this reaction; the compound is subjected to distillation; and the distillates which pass over at a temperature between 107° and 200° C. are collected. These distillates are then treated with nitric and sulphuric acid; the product is washed with water, and when treated with alcohol yields crystals having a marked odor of musk. This same characteristic odor has been encountered in many of the benzenes. The compound most widely used in commerce is the compound invented by Baur, and the ketone musk which Mallemann obtained by nitrating ketones with butyltoluene. More recently trinitro-butylxylence has been used as a substitute for natural musk. In the series of alcohols and ethers, terpilene should be mentioned. This compound is prepared by hydrating terpenes. Terpilene is much used by perfumers, by reason of its strong odor of syringa. It is often mixed with heliotropine, the two blending well. Cinnamic alcohol has the odor of hyacinth with a touch of rose; octyl alcohol has an odor closely resembling opoponax; nonyl alcohol, a mixture of orange and rose; ethyl butyrate, of pineapple; methyl salicylate, of wintergreen; amyl acetate, of pears; geranyl acetate, of rose geranium; benzyl acetate, of jasmine and ylang-ylang; lynalyl acetate of bergamot; benzaldehyde, of bitter almonds. Among the phenols, thymol, discovered by Doveri in the essence of thyme, but also extracted from other essential oils, is of extreme importance. In obtaining this aromatic compound, the essential oil of *Ajowan ptychocis* is agitated with soda lye. The mixture is allowed to settle, and the liquor is then decanted. Employed as an antiseptic, thymol finds its chief value as an ingredient of medicinal soaps. In this connection its antiseptic power is 30 times that of carbolic acid. Vanillin is both an aldehyde and a phenol. Many ways have been devised for its preparation; but they are all more or less modifications of two methods — synthesis of benzene derivatives which are of slight scientific interest and the oxidation of natural compounds, which is of more importance from an industrial point of view. Vanillin is employed not only by perfumers, but also by bakers and cooks, as a substitute for the vanilla of nature. Up to the present time it must be confessed that artificial perfumes have not curtailed the production of natural oils and pomades. At first it seemed that synthetic perfumes would result in cutting down the price of the natural product. But experience has shown that artificial essences, by reason of their coarseness, have not been able to dethrone natural perfumes in popular favor. Scientists, ingenious though they may be, have not as yet completely succeeded in reproducing the delicacy of nature.

History.— Perfumes of various sorts have been held in high estimation from the most ancient times. The Egyptians prepared them for various purposes; for embalming the dead, as offerings to the gods and for domestic uses. They anointed their bodies with sweet-scented oils, which they also poured upon the heads of newly-arrived guests. In the Bible frequent reference is made to the use of perfumes by the Hebrews. The Phœnicians, Assyrians and Persians are known to have made great use of them; Tyre was a famous mart where they were exported by sea, as Babylon was for the supply of the interior. The art was practised to an extraordinary extent by the Greeks and Romans. The odor of perfumes was an offering to the gods; after bathing and in their athletic exercises the Greeks applied them liberally to their persons. Their wines were perfumed by infusing in them roses, violets and hyacinths. Pliny gives a full account of the great variety of perfumes used by the Romans under the emperors. The use of perfumes was introduced by the Arabs into Spain. In the Middle Ages, France and Italy were most conspicuous for the use and manufacture of perfumes. Incense and fragrant tapers were consumed in the Church even as far back as the baptism of Clovis, 496. Charlemagne used perfumes and Philip Augustus granted a charter to the master perfumers in 1190. Alcoholic perfumes are supposed to have been first made in the 14th century; the first of these of which we have an account is Hungary water, distilled from rosemary in 1370, by Queen Elizabeth of Hungary, who received the receipt from a hermit, and by the use of it is said to have preserved her beauty to old age. When Catherine de' Medici went to France she was accompanied by a famous Florentine perfumer named René, and ever since that time the French have made great progress in the art. In Europe at the present time the manufacture of perfumes is carried on in Paris and London, and in various towns near the Mediterranean, especially in the south of France. Certain districts are famous for their peculiar productions; as Cannes for its perfumes of the rose, tuberose, cassia, jasmine and the neroli extracted from the leaves of the bitter orange; Nimes for thyme, rosemary, aspic and lavender; Nice for the violet and mignonette; and Sicily for the lemon, bergamot and orange. England claims the superiority for her lavender and peppermint; these herbs being cultivated upon a large scale at Mitcham in Surrey and at Hitchin in Hertford.

United States.— The growing of flowers and plants for perfumes in the United States has made very slow progress. A start has been made in Florida by one or two flower-growers, and experiments with perfume grasses have been made by the government. In Michigan, Indiana and New York large areas are devoted to peppermint, spearmint and erigeron. Michigan, Wisconsin and Nebraska produce wormwood oil. Sassafras oil is made in many localities along the Atlantic seaboard, from Pennsylvania southward. The oils of wintergreen, black birch, spruce and cedar are made in some quantity in the North Atlantic States and also in Tennessee and Kentucky. Oil of pennyroyal is made in Ohio and North Carolina. Most of these, however, are for use as flavoring extracts rather than for perfumes.

Production.— According to the special census of manufactures taken for the year 1914, there were then in the United States 496 establishments making perfumes and cosmetics. They employed an aggregate capital of $9,646,-613 and 3,748,414 persons were engaged in the industry. Their product for the year reached a value of $16,899,101, of which sum $9,434,315 represented the value added by the manufacturing processes. Practically all of the raw materials were imported.

Imports.— Since the war began nearly all of the materials used in making perfumery have come from France. For the year ended 30 June 1917 there were brought in a value of $406,136 in floral essences and $418,774 in other odor-bearing substances. From the Philippines came a value of $2,800. In addition to these raw materials there were brought in of ready-made perfumes, cosmetics, pastes, etc., a value of $2,772,539. The duty laid upon such goods is extremely high, ranging from 60 per cent to 78.68 per cent, the total duty collected on the imported perfumes for that year totaling $1,808,736. Including the essences, the value imported from France was $3,357,235; from England, $199,589; and from Switzerland, $144,484. Those from other countries were insignificant.

Consult Askinson, G. W., 'Perfumes and Cosmetics' (New York 1915); Charabot, E., 'Industrie des Parfums Naturels' (Paris 1912); Gattefosse, R. M., 'Technique de la Fabrication des Parfums Naturels et Artificiels' (Lyons 1913); Otto, M., 'L'Industrie des Parfums d'apres les Theories de la Chimie Moderne' (Paris 1909); Parry, E. J., 'The Chemistry of Essential Oils and Artificial Perfumes' (London 1908); Rimmel, E., 'The Book of Perfumes' (London 1867).

PERGAMUS, pėr'gạ-mŭs, or **PERGAMUM**, Asia Minor, an ancient city of Mysia, the modern Bergama, on the north bank of the navigable Caïcus, about 15 miles from the sea. Behind the town, on a conical hill, rose the acropolis, which was the original nucleus of the place. It was founded by emigrants from Greece and was selected by Lysimachus as a safe depository for his great wealth; he placed here 9,000 talents of gold in charge of his lieutenant, Philetærus. The city first rose to importance about the commencement of the 3d century B.C., when it became the capital of an independent state of the same name, founded by Philetærus, who had revolted against Lysimachus. A succession of monarchs reigned over the city and territory till 133 B.C., when Attalus III bequeathed on his deathbed his kingdom to the Romans, and it subsequently became a Roman province. Under the Byzantine emperors the prosperity of the city rapidly declined. Pergamus was one of the most magnificent cities of antiquity and was principally indebted for its architectural splendors to Eumenes II, who likewise founded the celebrated library of Pergamus, containing 200,000 volumes; inferior in extent and value only to that of Alexandria. The city was famed for its manufacture of tapestries, pottery and precious ointments. It was also famous for its manufacture of parchment, which derives its name (*Pergamena charta*) from this place. In ecclesiastical history it is memorable as one of the seven churches of Asia referred to by Saint John (Rev. 2:12). Excavations carried out on the site in 1878–86 resulted in the discovery of splendid architectural and sculptural treasures. The great library was removed by Antony and presented by him to Cleopatra.

The modern city of Bergama on the plain at the foot of the acropolis has a population of about 20,000 inhabitants. Consult Conze, A. C. L. (and others), 'Stadt und Landschaft von Pergamon' (Kœnigliche Museum zu Berlin, 3 vols., 1912–13); Dörpfeld, W., 'Die Ruinen von Pergamon' (Athens 1902); Pontremoli, E., and Colignon, M., 'Pergame' (Paris 1900).

PERGOLESI, Giovanni Battista, jō-vän'nē bät-tēs'tä pĕr-gō-lā'sē, Italian musical composer: b. Jesi, near Ancona, 3 Jan. 1710; d. Naples, 16 March 1736. In the Conservatory of the Poveri di Gesu Cristo at Naples he was initiated by Gaetano Greco in the mysteries of his art, and while a pupil there composed his sacred drama 'San Guglielmo d'Aquitania,' produced in 1731. About this time he wrote in addition to several operas, a famous intermezzo, or operetta, 'La Serva Padrona,' whose original indifferent reception was Pergolesi's greatest popular success, but which later became the basis of all Italian comic opera up to Rossini's time. In 1734 he was appointed chapel-master of the church of Loretto. In 1735 he was invited to Rome to compose the opera 'd'Olimpiade' for the theatre Tordinone. It met with no applause, while Duni's opera of 'Nerone,' performed at the same time, and far inferior to it, was lauded to the skies. Ill-health compelled him afterward to take up his residence at Pozzuoli, where he finished his celebrated 'Stabat Mater.' In addition to the above works he composed masses, a 'Kyrie cum Gloria,' a 'Salve Regina' and other church music; 30 trios for two violins and violoncello; and 'Orfeo et Eurydice,' a cantata. His posthumous recognition was somewhat exaggerated; but his achievement, despite his general lack of science, was considerable. Consult the study by Schletterer (1880).

PERI, *in Persian mythology*, the descendants of fallen spirits excluded from paradise until their penance is accomplished. They belong to the family of the genii or jinn, and are constantly at war with the dævas (the evil jinn). In earlier times they were themselves considered evil. They are immortal and spend their time in all imaginable delights. They are male and female, the latter being of surpassing beauty. The legends of the peris and the dævas are Avestan in origin.

PERIAGUA, pĕr-i-a'gwạ. See PIROGUE.

PERIANDER, pĕr-ĭ-ăn'dėr, Corinthian tyrant: d. about 585 B.C. He was a son of Cypselus, whom he succeeded about 625. His reign was at first mild but he soon developed into a tyrannous and oppressive ruler, though he was a patron of the arts and was reputed to be one of the Seven Wise Men of Greece. He prohibited the ownership of large numbers of slaves and luxurious habits and forbade the people from the country to live in the city. He put to death his wife Melissa, daughter of Procles, the tyrant of Epidarus, which circumstance when afterward related to her younger son Lycophron thoroughly alienated him from his father. Periander knowing Procles to have told his son of the mother's fate, thereupon made war upon Epidarus, reduced it, and took Procles prisoner. He then endeavored to make peace with his son, who resided at Corcyra, and proposed to visit him, whereupon the Corcyreans put Lycophron to death in order to avert the visit. His rule extended over Corcyra, Ambracia, Leucas and Anactorium, beside his kingdom of Corinth. He was said to have died of a broken heart over his son's death.

PERIANTH, *in botany,* the floral envelopes, the calyx and corolla, or either, especially when the calyx and corolla are combined so that they cannot be satisfactorily distinguished from each other, as in the tulip, orchis, etc. See FLOWER.

PERIBONKA RIVER, Canada, an affluent of Lake Saint John, in the province of Quebec, over 400 miles long. It flows from about lat. 52° N., southward through a forest and lake region, Manonan being the chief lake along its course.

PERICARDITIS, inflammation of the pericardium, the membrane enveloping the heart, essentially the same as inflammation of other serous membranes. It is either acute or chronic. In acute pericarditis the membrane is usually bright red with sometimes spots of ecchymoses and is covered with layers of soft or firm fibrinous exudation (false membrane) of varying thickness. Generally there is an effusion of flaky serum varying from a few ounces to a pint or more, which sometimes is sanguinolent. Rarely is pus present. If the serum is small in amount, or is absorbed, the sides of the pericardial sac adhere to each other in portions or entirely. Serum may distend the sac pulling apart adhesions into thread-like bands (hairy heart). Both serum and the exudate impede the action of the heart, especially if they are present in considerable amount. The principal causes of acute pericarditis are acute rheumatism and Bright's disease. It may also accompany pleurisy, pneumonia, erysipelas and the continued and eruptive fevers. Sometimes it results from penetrating wounds or contusions. An instance is recorded where a set of false teeth swallowed by an intoxicated man, causing ulceration of the œsophagus, was forced into the pericardial sac, pericarditis resulting. It occurs most often before the 25th year, rarely after the 45th, and in about one-sixth of the cases of acute rheumatism, is not, as popularly supposed, a transference (metastasis) of that affection, but a manifestation of it, due to the same condition of blood. When it appears in acute articular rheumatism, it occurs about the sixth day. The symptoms of acute pericarditis vary, depending on the amount of exudation and effused serum, and may be considered in connection with the three stages of the disease: (1) From the attack to the effusion, rarely beyond two days; (2) the stage of effusion; (3) stage of absorption. In the first stage there is more or less pain over the heart, increased by respiration; a shortened inspiration; generally a dry irritable cough and some tenderness; sometimes there is distress rather than pain. The action of the heart is increased; there is fever, anorexia and debility. When effusion occurs, pain and soreness are less. If there is much serum, symptoms of pressure upon the heart and irregular action of that organ appear, with a feeling of weight, faintness on exertion, a feeble and irregular pulse, dyspnœa, a feeble voice, sometimes vomiting, dysphagia and mental disturbances. The detection of acute pericarditis is sometimes difficult, especially if associated with pleurisy or pneumonia. To the physician it is revealed by the precordial or cardiac friction-murmur, by an increased area of normal dullness, and by the exclusion of the symptoms of other affections. The prognosis varies with the extent and character of the inflammation and its products and also with the resisting powers of the patient. Sometimes the disease is mild and recovery occurs; often it is dangerous, death occurring in a day or two from paralysis of the heart, or within a week or two from impaired and, it may be, poisoned blood. Even if recovery takes place from a moderately severe attack, the action of the heart is usually impeded more or less for a variable time by the contracting fibrinous exudation. It must be borne in mind that very frequently endocarditis is associated with pericarditis. The treatment demands rest, soothing applications, freedom from excitement, and the relief of pain by remedies that do not disturb the heart's action or lower the strength of the body. Extensive serous effusion may have to be removed surgically.

Chronic pericarditis is usually one of the results of an acute inflammation following it after two or three weeks, but it may exist independently as a subacute affection from the outset. Generally there is little or no effused serum, but there are several layers of fibrinous exudation. Sometimes liquid distends the sac. Pus is rare. Usually there is little pain; but the heart is feeble; circulation is poor; dyspnœa is common, especially on exertion. If the lung is compressed, blood-tinged mucus may be expectorated. The prognosis is unfavorable because of the probability of repeated attacks, the likelihood that adhesions will form, and the presence of myocarditis. Suppurative pericarditis is nearly always fatal if associated with a general septicemia. The treatment of chronic pericarditis requires tonics, saline laxatives, and attention to hygienic measures.

PERICARDIUM, the investing fibro-serous sac or bag of the heart in man and other animals. In man it contains the heart and the origin of the great vessels. It lies behind the breast-bone, between the pleuræ and from the third to the seventh ribs. Its apex or smaller extremity is directed upward, and at this point it encloses the great blood-vessels about two inches above their origin from the heart. The base of the pericardium is fixed to the central tendon of the diaphragm or midriff. It rests upon the bronchi, the gullet and the descending aorta, behind; while the margins of the lungs overlap it in front. The sac consists of two layers, an outer or fibrous and an inner or serous layer. The fibrous layer is continued upward on the great blood-vessels, and gradually merges into their outer coats. Its inner or serous layer, which directly invests the heart, is reflected over the inner surface of the fibrous layer, and it therefore consists in reality of two layers or portions — a visceral portion, surrounding the heart, and a parietal portion, reflected on the fibrous layer. A single fold of the serous layer of the pericardium encloses the aorta and pulmonary artery. The inner surface of the membrane secretes a serous fluid, which in health is present only in sufficient quantity to lubricate the heart, and so to facilitate its movements within the sac. Galen was familiar with pericardial effusion in animals and suspected it in man. In 1824 Collin discovered the pericardial friction rub from which the dry form of pericordites is easily recognized. The pericardium of an adult man with a healthy heart is capable of holding from 14 to 22 ounces of fluid. The pericardium is liable to various serious forms of diseased action. Of these pericarditis (q.v.) is the most common. Others are hydropericardium, hemopericardium, pneumopericardium and new growths in the pericardium. See HEART.

PERICLES, pĕr'ĭ-klēz (Greek, Περικλῆς), Greek statesman, whose age was the most flourishing period of Grecian art and science: b. Athens, about 498B.C.; d. there, 429 B.C. He was the son of Xanthippus and Agarista, both members of the best families of Athens, and the youth grew up in this choice environment. Damon, Anaxagoras and Zeno of Elea were his instructors. It was thought that from Anaxagoras Pericles derived the elevation and independence of mind and the remarkable eloquence which characterized him in his public life. In 469 he entered upon his career as a statesman. Up to this time only the nobler and more influential citizens had held control of the important offices. Pericles accomplished the absolute democratization of the state. At once he proclaimed himself champion of the people's party, in opposition to his friend Cimon, the aristocratic leader, and won favor by the legislation which he effected. Thus, he brought about the enactments that citizens serving as soldiers or as judges in the courts of the Heliæa should be paid, and that the public treasury should provide the two oboli charged for admission to the theatre at the Dionysia for such citizen as could not afford them. In 462–461, through Ephialtes, he introduced the measure by which the court of Areopagus was deprived of all those valuable political powers which made it antagonistic to his own success. Cimon was disposed of by being exiled, and conservative resistance was slight. Subsequently Pericles himself obtained the return of his opponent, who died at the siege of Citium in 449. For 30 years Pericles was undisputedly the foremost personage of Athens. Popular allegiance was strengthened by further changes. A salary was attached to the archonship, and in course of time the office was made accessible to all citizens. All officials were eventually salaried. Poorer citizens were established in holdings in the Athenian colonies. The foreign policy of Pericles was based on the purpose of making Athens supreme in Greece. In 445 he conquered the revolted island of Eubœa; in 441–440 he subdued Samos, Sophocles being among the generals of the expedition. During the 10 years' interim preceding the Peloponnesian War, Pericles devoted his attention to increasing the maritime strength of Athens and to developing those plans of art which made Athens the wonder not alone of Greece but of the world. The funds obtained through the tribute of allies were applied to these designs. Among the temples and public buildings erected under his administration were the Odeum, the Propylæa and that unapproached marvel of the architectural skill of Ictinus, the Parthenon. The impetus thus afforded to the fine arts was notable. Phidias directed the general work upon the edifices. But while his personal achievement was very great, it is evident that that age must have been well supplied with architects, plastic workers and decorators of admirable powers. The Parthenon sculpture, 50 colossal statues and 4,000 square feet of frieze and metope could not all have been done by Phidias, yet all is of about equal merit. These works diffused at Athens every sort of activity, and the consequent prosperity confirmed the influence of Pericles. The Peloponnesian War (q.v.) has been incorrectly ascribed to his ambition. Incorrectly, because, while he did urge resistance to Lacedæmonian demands, he did so because he saw that war was inevitable, and was convinced that as long as Athens retained the influence then possessed Sparta would never be content. At the commencement of the war (431 B.C.) Pericles recommended to the Athenians to turn all their attention to the defense of the city and to naval armaments rather than to the protection of their territories. Accordingly, as commander-in-chief, he allowed the superior forces of the Spartans and their allies to advance to Acharnæ, in Attica, without resistance, and at the same time sent a fleet to the shores of Peloponnesus, to Locris and Ægina, which took twofold vengeance for the ravages in Attica. After the Peloponnesians retired he invaded the territory of Megaris, which had been the cause of the war. At the end of this campaign he delivered a eulogy over those who had fallen in their country's service. The next year a plague broke out at Athens which wrought such dreadful havoc that Pericles was obliged to summon all his fortitude to sustain his countrymen and himself. To occupy their attention he fitted out a large fleet and sailed to Epidaurus; but the mortality among his troops prevented him from effecting anything important. He returned with a small force; but the Athenians no longer put confidence in him. He was deprived of command and obliged to pay a heavy fine, though no particular crime was charged against him. The people, however, soon recalled him and gave him more power than before. He died of the pestilence after being 40 years the ruler of Athens — 25 years with others and 15 years alone. Pericles maintained a reserve quite unwonted among Athenian statesmen. Such was his dignity, according to Plutarch, that "the epithet Olympian — attached to his name by a rash and thoughtless crowd —" was "a worthy and becoming title." His oratory was very highly esteemed, and as a military commander he was able, though he did not particularly seek distinction in that field. His exalted position may be the more truly appreciated when it is remembered that he was the central figure of a group including such eminent personages as Sophocles, Euripides, Æschylus, Socrates, Anaxagoras and Zeno, and numbered also Herodotus, Hippocrates, Democritus, Pindar and Empedocles among his fellow countrymen. There is little doubt that his policy of personal government had for Athens injurious results. He had been the greatest man in the state, but had not encouraged a second; and at his death democracy was helpless and a prey to demagogues. His lofty ideals, however, and their influence, became a permanent part of civilization. There are accounts of him by Plutarch and Thucydides. Consult also Abbott, Evelyn, ‘Pericles, and the Golden Age of Athens’ in ‘Heroes of the Nations’ (New York 1891); Lloyd, W. W., ‘The Age of Pericles’ (2 vols., London 1875).

PERICLES, Prince of Tyre. ‘Pericles’ is the only play now in the Shakespeare canon, which was not included in the 1623 Folio. It was, however, printed in quarto with Shakespeare's name on the title-page twice in 1609 and four times thereafter. There is no question that at least two authors, possibly three, collaborated in this drama, and modern criticism is agreed that one of these is Shakespeare, whose hand reveals itself distinctly at the opening of Act III, scene 1, if not earlier. Evidently Shakespeare created the poetical Marina scenes of the last three acts in the same spirit in which he created the Perdita scenes of ‘The Winter's Tale’ and the Miranda scenes of ‘The Tempest.’ Whether he wrote the coarse prose scenes of Act IV is more doubtful, but Fleay's effort to father them upon William Rowley rests on thin evidence. That they are utterly unlike Shakespeare or injudiciously introduced into the play cannot safely be asserted. Practically all the first two acts and the Gower speeches as a whole are now most usually ascribed (on Delius's suggestion, 1868) to George Wilkins, who in 1608 published a prose version of the story, frankly based upon the play. D. L. Thomas, however, who recognizes Shakespeare's touch largely in the first two acts and almost exclusively in the last three, argues interestingly for Thomas Heywood as the collaborator. *Engl. Studdien* (XXXIX, 210–239, 1908). The story of ‘Pericles’ is one of the most popular and most ancient in mediæval literature. It is the subject of the last tale in Gower's 14th century ‘Confessio Amantis’ where it fills nearly 2,000 lines. The drama seems to be indebted to Gower and particularly to a more recent prose version in Lawrence Twine's ‘Pattern of Painful Adventures’ (licensed 1576). The hero is in most forms of the story called Apollonius of Tyre, the name Pericles in the play being possibly a reminiscence of Pyrocles, one of the chief figures in Sidney's ‘Arcadia.’ The exclusion from the first and second folios of a play of which six quarto editions between 1609 and 1635 claimed Shakespeare as author may be taken to prove that the poet repudiated the vitiated text we possess. There is no doubt, however, that ‘Pericles’ was an enormously popular work both on the stage and in printed form; and it is equally certain that it contains much fine Shakespearean poetry, quite typical of the author's latest style. In subject and dramatic method the play most resembles ‘The Winter's Tale,’ which likewise leaps over long times and distances and likewise deals with a king's ultimate recovery of his lost and supposedly dead wife and daughter. As it stands, ‘Pericles,’ with its long prologues and elaborate dumb-shows, its spectacular plot and continual shifting of scene through the entire Mediterranean world, reminds one, probably more than any other Elizabethan play, of the modern moving-picture show. In a recent article «On the Date and Significance of Pericles» (*Modern Philology*, XIII, 1916), T. S. Graves has shown that the Venetian ambassador in London probably sought to make diplomatic use of a performance of the play as early as the close of 1606, with the idea that the representation of the scene (I, 4) in which Pericles brings ships of grain to the relief of famine-stricken Tarsus would increase popular and royal favor for the project of securing English wheat for the use of Venice.

TUCKER BROOKE.

PERICLES AND ASPASIA, by Walter Savage Landor, was first published in two volumes in 1836; with numerous additions, in the Collected Works of 1846. It is a representation of Athenian society in the great age by means of a series of imaginary letters, in which are included several imaginary speeches by Pericles and abundant specimens of verse attributed to a great variety of Greek poets. Pericles, Alcibiades and Anaxagoras participate in the correspondence, but the bulk of it is carried on by Aspasia and her bosom friend, Cleone of Miletus. The two women are alike interested in literature and politics, and their relations are made piquant by the fact that Cleone loves Xeniades, who follows Aspasia to Athens, and dies there of unrequited passion. To Cleone, Aspasia relates with sweet effusion her first glimpse of her hero, Pericles, at the theatre, whither she has gone in disguise to see the Prometheus of Æschylus acted; comments on current literature, art, morals, foreign affairs, war; describes a call from Sophocles, a reading by Thucydides, the marriage of Socrates; and exchanges with her friend bits of original verse. It would require a sensitive ear always to distinguish these fine bluestockings from one another or either from Pericles; for all the Greeks show a marked bias toward the terse, thoughtful, critical, sententious style of Landor. He apparently thought of his work as a kind of concentrated extract of the Periclean Age — its history and poetry redistilled by an independent English imagination in love with the glory that was Greece. It is one of the longest, most ambitious and, according to the judgment of his devoted admirers, one of the most successful of his efforts in prose — «perhaps the richest mine,» says Sidney Colvin, «which English prose literature contains of noble and unused quotations.» Consult Forster, John, ‘Walter Savage Landor’ (1869); Colvin, Sidney, «Landor» in ‘English Men of Letters.’

STUART P. SHERMAN.

PERIDINIUM; PERUTINIDÆ, respectively, a genus and a family of Dinoflagellate Protozoa at times coloring parts of the sea red. See RED WATER.

PERIDOT, a pale, yellowish-green or pistachio-colored variety of chrysolite (q.v.). It is used as a gem, but is soft and difficult to polish. In New Mexico and Arizona it is found abundantly in small grains or pebbles in the sands. From their form they are commonly known as «Job's tears.» It is obtained also in Brazil and Egypt, and on an island in the Red Sea.

PERIDOTITE, pĕr'ĭ-dō-tīt, a rock of which the essential constituent is olivine. It is of ultra-basic composition, is free from quartz and feldspar, and is of igneous origin. With the olivine are associated more or less of the minerals augite, enstatite, magnetite, diallage, hornblende, chromite, and sometimes biotite. According to the kind of accessory mineral and its amount relative to the amount of olivine, the following varieties have been distinguished: dunite, saxonite, lherzolite, buchnerite, eulysite and picrite. Of these the first four appear in meteorites, as well as in terrestrial rocks, while the others have been discovered only in the latter. From the abundance of magnesia in the peridotites they are sometimes known as magnesian rocks. Their component minerals readily change by taking up water as the result of weathering into serpentine.

PÉRIER, pā-rē-ā, **Casimir Pierre,** French politician: b. Grenoble, 11 Oct. 1777; d. Paris, 16 May 1832. He studied at the Oratorian college in Lyons, and then in Paris; fought in Italy in 1795; became a partner in his brother's bank; and was very successful in his varied business ventures, soon becoming a director of the Banque de France. He was elected to the House of Deputies in 1817, and made his mark there as a financier, but especially as a conservative. He wrote against the means by which the duc de Richelieu attempted to obtain funds for the indemnity due the Allies. He sharply opposed the domestic policy of Polignac in 1829 and signed the ‘Address of the 221.’ He did not approve of the revolution of 1830 but acquiesced in it; served as minister in Lafitte's cabinet, but soon retired; in 1831 became Prime Minister, taking the portfolio of the interior; and in this office carried out what he called the «policy of the right mean» in domestic affairs, showing himself severe toward the republican opposition but insisting on his independence of the king — for instance in the matter of the meeting place of the cabinet, which he arranged should be at his home and not at the Tuileries. He regarded the stand of the king toward the mob as weak and too conciliatory. His foreign policy was «non-intervention»; but in 1832, in spite of the united opposition of the majority of his colleagues and the king, he sent an armed force to Ancona as a check on Austria's influence on the papacy. A naval demonstration at Lisbon was also carried out after the Portuguese government had refused compensation for certain injuries to French subjects. The awful cholera plague in Paris was met by strict sanitary measures devised by Perier and carried out under his personal supervision. In this work he was attacked by the plague, to which he fell a speedy victim, worn out as he was with overwork and anxiety. Consult Castille, ‘Casimir Perier’ (1859); and Nicoullaud, ‘Casimir Perier, Député de l'Opposition’ (1894).

PÉRIERS, pā-rē-ā, **Jean Bonaventure des,** French poet: b. Arnay-le-Duc, Bourgogne, about 1500; d. 1544. He collaborated in the first French translation of the Bible which appeared in 1534, he collaborated with Dolet in ‘Commentaires de la langue latine’ in 1536. He received favor from Marguerite of Navarre in 1536–37 but his ridicule of human institutions in ‘Cymbalum Mundi’ lost him all court favor. This work was publicly burned and Periers found himself a social outcast. It is said that he committed suicide. An edition of his works was issued in Paris in 1866 and the year 1874 saw a special edition of the ‘Cymbalum Mundi.’

PERIGEE, pĕr'ĭ-jē, that point in the orbit of the moon which is at the shortest distance from the earth. See MOON.

PÉRIGORD, pā-rē-gōr, France, an ancient province forming part of the military government of Guienne and Gascony now represented by Dordogne and part of Lot-et-Garonne. See FRANCE.

PÉRIGUEUX, pā-rē-gė, France, capital of the department of Dordogne on the right bank of the Isle, 68 miles east-northeast of Bordeaux. The chief buildings are the 10th century church of Saint Etienne de la Cite, a Byzantine cathedral with a lofty tower and five small cupolas, built in 984–1047 and restored in 1865, a handsome modern prefecture, a courthouse, hospital, museum, library, barracks and theatre. The manufactures are bombazine, serge, hosiery, cutlery, nails, pottery, liqueurs, spirits, leather; many hands are employed in cutting and polishing marble. One article of trade is the famous partridge and truffles (*pâtes de Périgueux*). Périgueux is the Vesuna of Cæsar, and near the town are the remains of a vast amphitheater, of ancient aqueducts, baths and temples. The completely destroyed Vesuna of the Petrocoriani, who first inhabited this district, was somewhat further south than the present town; the Vesuna of the Romans is that part of the town now known as *la Cité*. The Tour de Vésonne is a remarkable Roman structure, 67 feet high and 200 feet in circumference, with neither door or window. Périgueux was one of the eight towns ceded to the Protestants in 1576.

PERIHELION, *in astronomy,* that part of the orbit of the earth or any other planet in which it is at the point nearest to the sun. The «perihelion distance» of a heavenly body is its distance from the sun at its nearest approach.

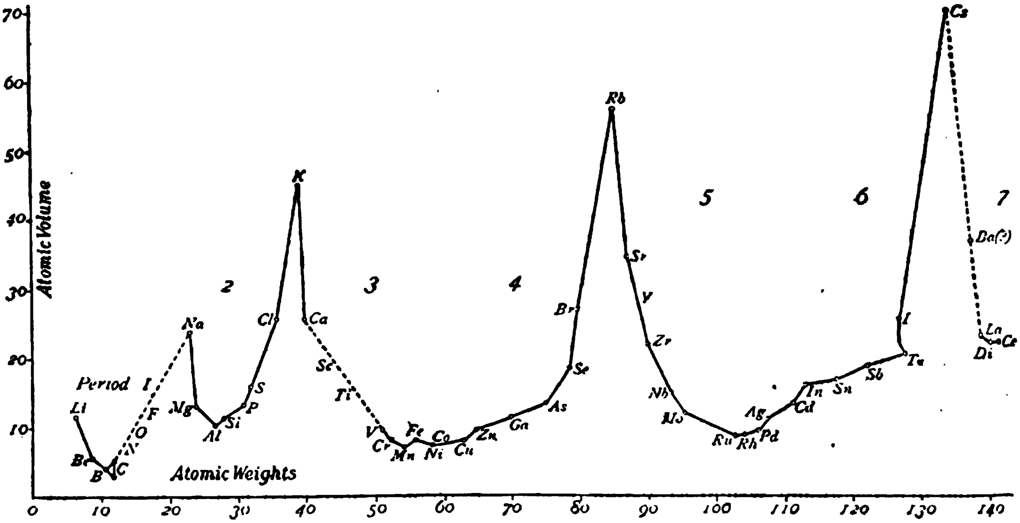
PERIM, pā-rēm', British island in the Strait of Bab-el-Mandeb, 12° 40′ N. and 43° 23′ E., two miles from the Arabian coast and 12 miles from Africa. It has neither water nor vegetation and the entire island (about six square miles) is merely the remains of a great volcano. It was seized for the second time by the British in 1857, in spite of the protest of nearly all the Powers; has a fortress and lighthouse, built in 1861, and a small garrison; and is a key to the Suez Canal. The harbor is excellent.

PERINÆUM, or **PERINEUM,** the outlet or floor of the pelvis, comprising muscles, blood-vessels, nerves, the lymphatic glands, the anus and a portion of the vagina in females and the genital apparatus in males. It is somewhat triangular in shape and is bounded by the rami of the pubes and ischia, the tuberosities of the ischia, the sacro-ischiatic ligaments and the apex of the coccyx. The portion between the pudendum and the anus is sometimes called the anterior perinæum, or triangle, and that between the anus and coccyx the posterior or triangle. The perinæum is sometimes ruptured or torn during the birth of a child, especially in primiparæ, and is sometimes the seat of operation for the removal of a stone from the bladder (perinæal lithotomy). Stone in the bladder in children can often be diagnosed through the rectum and, if the whole hand is introduced, the entire pelvis may be explored. Consult Shepherd, Francis J., 'Anatomy of the Perinæum' (in 'Reference Handbook of the Medical Sciences,' New York 1916).

PERIOD, in geologic chronology, a time interval the value of which has been variously interpreted. The special committee of the International Congress of Geologists at the Bologna meeting in 1881 recommended the use of the term period for the time division of second magnitude, that for the first being *era.* The rocks formed during this time period were to be grouped as a system. According to this usage we should have Cambrian, Ordovician, Silurian, Devonian, etc., periods. In this sense the term is used by the United States Geological Survey. Dana on the other hand uses *era* for this time division, giving *period* a subordinate rank — as Niagara period, Onondaga period, Lower Helderberg period. The New York State Survey uses the term in nearly this sense but emphasizes more especially the threefold division of each era, that is, early, middle and later Devonian periods, or early, middle and later Cambrian periods. The dual nomenclature of geologic classification, that is, the separate grouping of the time divisions and of the corresponding rock divisions was first strongly urged in this country by Prof. Henry S. Williams of Cornell (late of Yale). He also proposed the use of the prefixes *eo, meso* and *neo* for the periods. Thus he uses *Eosilurian, Mesosilurian* and *Neosilurian* periods. The New York State Survey has adopted these terms with the substitution of *palæo* for *eo.* Consult Williams, 'The Making of the Geological Time S. Cal.' (*Journ. of Geol.* I, 180–197); 'Dual Nomenclature in Geological Classification' (ib., II, 145–160); 'Geologic Biology' (1895); Clarke and Schuchert, 'The Nomenclature of the New York Series of Geologic Formations' (*Science,* 8 Dec. 1899), and *American Geologist* (February 1900). See AGE; CENOZOIC; ERA; FORMATION; MEZOZOIC; PALEOZOIC; QUATERNARY; SECONDARY; SERIES; SYSTEM; TERTIARY.

PERIODIC LAW, *in chemistry,* the law which teaches that the properties of the elements are periodic functions of the atomic weights; so that when the elements are arranged in the order of increasing atomic weights, similar properties recur periodically, as we proceed from one end of the array to the other. It had long been known that certain approximate numerical relations exist among the atomic weights of elements that have strikingly similar properties. For example, if we consider the three closely related elements lithium, sodium and potassium, we find that the atomic weight of sodium is almost exactly the arithemetic mean between the other two. Thus $Li = 6.94$ and $K = 39.10$, the mean of which is 23.02; and the atomic weight of sodium is 23.00. Again, in the triad calcium, strontium and barium, we have $Ca = 40.07$ and $Ba = 137.37$, the mean of which is 88.72; and the atomic weight of strontium is 87.63. The triad chlorine, bromine and iodine affords still another familiar example, for we have $Cl = 35.46$ and $I = 126.92$, giving a mean of 81.19; and the atomic weight of bromine is 79.92. These relations, of whose precise significance we are still ignorant, forcibly suggest a relationship among the elements, similar (for example) to that prevailing among the paraffins in organic chemistry; for the paraffins all have analogous properties, and their molecular weights form an arithmetic series. In 1862 De Chancourtois conceived the idea of arranging all of the known elements along a helix, each element being represented by a point, whose distance from some fixed point, as measured along the helix, was numerically equal to the atomic weight of the element. He chose the unit of measurement, to be used in laying off the positions of the various points, so that a difference of 16 in the atomic weights of two elements corresponded to a complete turn of the helix. He then endeavored to show that similarity in properties in any group of elements corresponds to some simple geometric relation among the representative points. Chlorine, bromine and iodine, for example, are represented by points that lie sensibly upon a straight line parallel to the axis of the helix. De Chancourtois was primarily a mathematician and geologist, and his contribution to chemical science did not receive the attention that it merited until many years had elapsed. In 1864 and 1865, Newlands published two papers in which he exhibited the elements in a tabular array, following the order of increasing atomic weights approximately, but not without some slight transpositions. He pointed out that the elements in his scheme fall into groups, and he likened the members of each group to the notes composing one octave in music, calling the regularities which he pointed out the "law of octaves." In March 1869, Mendeléeff read a paper before the Russian Chemical Society, in which he examined the whole subject with great thoroughness, investigating the way in which various properties of the elements change with the atomic weights. His general conclusion was, that the measureable properties of the elements do not, as a rule, increase or decrease continuously as the atomic weights increase, but that they exhibit a species of periodicity, increasing and decreasing alternately, though apparently not with sufficient regularity to admit of representation by a definite mathematical expression. In 1870 Lothar Meyer, independently of Mendeléeff, published an important paper on the same subject, in which he showed that the periodicity of the "atomic volumes" of the elements is especially marked; "atomic volume" being defined as the quotient obtained by dividing the atomic weight of an element by the specific gravity of the element in the solid state. Meyer's diagram, with some changes and additions to bring it down to date, is presented in the accompanying engraving. The atomic weights of the elements are here laid off along a horizontal line, or "axis," and the corresponding atomic volumes are laid off vertically, according to the scale given at the left. In this way a series of points is obtained, corresponding to the respective elements; and through these points a broken line has been drawn, so that as we proceed along the line from left to right we pass the different elements in the order of ascending atomic weights. The specific gravities of some of the elements, in a solid state, are not known, and those of others (such as nitrogen) are more or less uncertain, owing to the great experimental difficulties involved in their determination. Without doubt, therefore, Meyer's diagram will be still further modified, as our knowledge of the physical properties of the elements increases. There are five regions in the diagram, for which we possess no acceptable data concerning the specific gravities in the solid state, and for which, therefore, we do not know the atomic volumes. These regions are indicated by the dotted lines. In two places, also, the line passing through the representative points does not strictly follow the order of increasing atomic weights. Argon (A), for example, appears to have an atomic weight slightly greater than that of potassium (K), and yet there seems to be no doubt but that argon should precede potassium as we pass along the broken line to the right. Argon forms no compounds, and its atomic weight is known only by inference from its density; so that this trifling irregularity can hardly be considered serious. Again, tellurium (Te) precedes iodine (I) on the diagram, although the diagram shows the atomic weight of tellurium to be the greater by a trifling amount. The atomic weight of tellurium, however, is still more or less uncertain. According to some authorities, it is actually less than that of iodine, so that the slight discrepancy here shown disappears altogether.

It will be seen that the broken line exhibits a marked tendency to vary in height in a periodic manner, now rising to a strongly accentuated maximum height, and again sinking to a minimum that is less distinctly emphasized. The irregularities are doubtless due in part to the imperfection of our data; but many of them, without doubt, are real and due to causes that we cannot yet understand. At the highest points of the diagram we find the metals of the alkalis — sodium (Na), potassium (K), rubidium (Rb) and cæsium (Cs)—whose physical and chemical properties are strikingly similar. Passing down the line to the right of these several elements, the first points that we come to are those corresponding to magnesium (Mg), calcium (Ca), strontium (Sr) and barium (Ba), which also form a group with markedly similar properties. If we pass downward to the left from the highest points, we first come to the group neon (Ne), argon (A), krypton (Kr) and xenon (X) which are distinguished by their singular chemical inertness. Beyond these, on the left, comes the group fluorine (F), chlorine (Cl), bromine (Br) and iodine (I); and next beyond these come oxygen (O), sulphur (S), selenium (Se) and tellurium (Te). Many other singular correspondences may be observed on the diagram; and as it is highly improbable that these are merely accidental, we must conclude that some fundamental unity, either of structure, material or internal motion, pervades the substances that we call "elements."



Mendeléeff (and Meyer also) arranged the elements in tabular form, in such a way as to bring out their correspondences quite clearly. Mendeléeff's arrangement (with some modifications and additions) is presented herewith. The elements, it will be seen, are divided into nine groups, each of which is entered in a separate column. They are also divided into 12 "series" each of which is entered upon one horizontal line. The atomic weights increase across the table from left to right. The elements in any one column are similar to one another in many ways, the resemblance being sometimes very striking. Hydrogen does not properly fit into the table at all. Copper, silver and gold, it will be seen, are entered both in the first group and in the eighth one. This is because their true positions are doubtful, some considerations indicating the first group, while others point equally well to the eighth. The eighth group is an anomalous one at best, for the metals that compose it are so similar that it appears necessary to arrange them in threes (or fours), each little group of this kind being considered as lying upon one and the same horizontal line of the table. Between cerium and ytterbium in atomic weight there are a number of closely-allied metals, the metals of the rare earths, which do not fit into the periodic system in any natural manner, and are omitted from the table. In any given group, the elements of the even series (2, 4, 6, 8, 10 and 12) resemble one another, as a general rule, more closely than they resemble those in the odd series of the same group; this fact (which is not true in all parts of the table) is indicated by indenting the odd and even series differently.

The full significance of Mendeléeff's table cannot be understood without an exhaustive study of the chemical deportment of the elements classified. At the top of the table, and immediately under the group number, formulæ are given which indicate the character of the compounds that the elements of the corresponding group form when combining directly with hydrogen. Thus, in combining with hydrogen alone, carbon yields the saturated compound CH_4; nitrogen yields NH_3; oxygen yields OH_2; and fluorine yields FH. The elements of groups I. II and III, either do not combine directly with hydrogen, or they form compounds which are unstable; and the elements in group IX do not form any compound at all. Most of the elements combine with oxygen in more than one proportion; but there is usually one oxide which may be regarded as characteristic of the element. The formulæ of these oxides for the different groups are given in the second line under the group number. In some cases the general formula for the oxide does not correspond to the particular oxide that is commonly regarded as typical of the element in question. The oxides of manganese, for example, are analogous to those of lead in many respects; and yet manganese appears in the seventh group and lead in the fourth. But it should be observed that manganese has an oxide of the form Mn_2O_7, while lead has not so far as is known; and in this sense, at least, the oxide R_2O_7 may be said to be characteristic of manganese. The oxides of group VIII do not, in general, correspond to the typical formula RO_4; though osmium and ruthenium have oxides of this form. It must be remembered, throughout, that the “periodic law” is more or less elastic, and that in classifying the elements in groups we have to consider their properties as a whole, and not simply some one of them, nor some few. In Mendeléeff's arrangement, for example, attention has been paid to the melting points, boiling points, spectra and magnetic properties of the elements, as well as to the colors and heats of formation of their salts. Other physical and chemical properties have likewise been examined in the light of the “periodic law,” and the arrangement here suggested is that which appears to best represent the entire mass of relationships.

It is evident that if an erroneous atomic weight were assigned to any element whose place in the periodic scheme is definitely fixed by its general physical and chemical properties, the error would be detected if it were great enough to transfer the element in question to a position already occupied by another element, or to a group in which it manifestly did not belong. Several instances could be given in which a disagreement of this kind has led to further research, followed by the improvement of the atomic weight of an element in the direction indicated by the periodic law. The atomic

MENDELEEFF'S TABLE OF THE ELEMENTS (Modified and Extended). [0 = 16].

Series	GROUP I. R_2O	GROUP II. RO	GROUP III. R_2O_3	GROUP IV. RH_4 RO_2	GROUP V. RH_3 R_2O_5	GROUP VI. RH_2 RO_3	GROUP VII. RH R_2O_7	GROUP VIII. RO_4	GROUP IX.
1	Hydrogen = 1								Helium = 4
2	Lithium = 7	Glucinum = 9.1	Boron = 11	Carbon = 12	Nitrogen = 14	Oxygen = 16	Fluorine = 19		Neon = 20.2
3	Sodium = 23	Magnesium = 24.3	Aluminum = 27	Silicon = 28.3	Phosphorus = 30.9	Sulphur = 32	Chlorine = 35.5	Iron = 55.9 Nickel = 58.7 Cobalt = 59 (Copper = 63.6)	
4	Potassium = 39	Calcium = 40.1	Scandium = 44.1	Titanium = 48.1	Vanadium = 51.1	Chromium = 52	Manganese = 55		Argon = 39.9
5	Copper = 63.6	Zinc = 65.4	Gallium = 69.9	Germanium = 72.5	Arsenic = 75	Selenium = 79.2	Bromine = 79.9	Ruthenium = 101.6 Rhodium = 103 Palladium = 106.7 (Silver = 107.9)	
6	Rubidium = 85.4	Strontium = 87.6	Yttrium = 89	Zirconium = 90.7	Niobium = 93.5	Molybdenum = 95.9			Krypton = 82.9
7	Silver = 107.9	Cadmium = 112.4	Indium = 114.8	Tin = 119.1	Antimony = 120.3	Tellurium = 127.5	Iodine = 126.9		Xenon = 130.2
8	Cæsium = 132.8	Barium = 137	Lanthanum = 138.5	Cerium = 140.3					
9								Osmium = 191.2 Iridium = 193.1 Platinum = 195.2 (Gold = 197.3)	
10			Ytterbium = 172.4		Tantalum = 181	Tungsten = 184.1			
11	Gold = 197.3	Mercury = 200.4	Thallium = 204	Lead = 207.1	Bismuth = 208				
12		Radium = 226.4		Thorium = 232.5		Uranium = 238.4			

weight of titanium, for example, was formerly taken as 52, this being the result indicated by actual analysis of its compounds. But with this atomic weight it did not fit into the general classification, which called for an atomic weight of about 48. Thorpe, by a new investigation, showed that 48 is correct. The order in the table, however, of tellurium and iodine, and of argon and potassium, is not the order of their atomic weights.

Mendeléeff found it impossible to construct his table without leaving many of the spaces in it vacant. He considered these vacancies to correspond to elements which were not then known, but which would probably be discovered in the future. In 1871 he wrote a paper upon this subject, in which he essayed to predict the general properties that three of these unknown elements must have, in order to fit well into the periodic scheme. It is gratifying to record that he has lived to see all three of them discovered, and to know that his predictions have been verified with extraordinary accuracy. The metals so predicted are now called «gallium,» «scandium» and «germanium,» respectively, for the three countries (Gallia, Scandinavia and Germany), in which the rare earths containing them were discovered. His predictions for scandium (which he provisionally called «eka-boron» from its position in the table, and denoted by the symbol Eb), may be compared with the actual properties of that metal in the following manner:

EKA-BORON (*hypothetical*).	SCANDIUM (*actual*).
1. Atomic weight about 44.	1. Atomic weight 44.
2. Oxide will have formula Eb_2O_3; will be soluble in acids, but insoluble in alkalis; specific gravity of oxide about 3.5; analogous to Al_2O_3, but more basic; less basic than MgO.	2. Oxide has formula Sc_2O_3; is soluble in strong acids, but insoluble in alkalis; specific gravity of oxide = 3.8; analogous to Al_2O_3, but more decidedly basic.
3. Salts of Eb will be colorless, and will yield gelatinous precipitates with KOH, K_2CO_3, Na_2HPO_4 etc.	3. Solutions of Sc salts are colorless, and yield gelatinous precipitates with KOH, K_2CO_3, and Na_2HPO_4.
4. Sulphate will have the formula $Eb_2(SO_4)_3$ and will form, with K_2SO^4, a double salt which will probably not be isomorphous with the alums.	4. Sulphate has the formula $Sc_2(SO_2)_3$, and forms, with K_2SO_4, the double salt $Sc_2(SO_4)_3$, $3K_2SO_4$, which is not an alum.

Of the discovery of the periodic law, whose antecedents are briefly mentioned above, Mendeléeff says: «Neither De Chancourtois, to whom the French ascribe the discovery of the periodic law, nor Newlands, who is put forward by the English, nor L. Meyer, who is now cited by many as its founder, ventured to foretell the *properties* of undiscovered elements, nor to alter the 'accepted atomic weights,' nor, in general, to regard the periodic law as a new, strictly-established law of nature, as I did from the beginning (1869).» He claims the discovery of the law for himself, on the ground that it was he who first established it in such a way that it can be used to correct the results of direct observation, to predict new elements and their properties, and (in his own words) to «permit the invisible to be seen, and the unknown known.»

One of the most interesting things about the periodic law is that it appears to indicate a finite limit to the number of elements existing. Thus if all the vacant spaces in the table were filled, the number of elements would still be less than 120. It does not appear probable that other elements will be discovered whose atomic weights are less than that of hydrogen. On the other hand, it appears from considerations entirely foreign to the periodic law that elements having atomic weights materially greater than that of uranium would not be stable. Modern research indicates that radium, thorium and uranium are all on the verge of instability, and perhaps just over the verge.

The modern explanation for the phenomena summed up by the periodic law is that the atom is a system of very small negative electrons (q.v.) in a relatively large sphere of positive electrification, that the atomic weight is proportional to the number of electrons in the atom and that the stable arrangements of electrons are in a general way periodic functions of the number of electrons to be arranged.

For detailed information regarding the periodic law, consult Garrett, 'The Periodic Law' (London 1909); Huth, 'Das periodische gesetz der atomgewichte' (Frankfurt 1884); Meyer, Lothar, 'Modern Theories of Chemistry'; Mendeléeff, 'Principles of Chemistry' (3d English ed., London 1905); Newlands, 'On the Discovery of the Periodic Law' (London 1884); Ramsay, Sir W., 'Modern Chemistry' (New York 1901); Richardson, 'The Electron Theory of Matter' (Cambridge, England, 1914); Venable, 'A Bibliography of the Periodic Law' (Easton, Pa., 1896).

PERIODICAL LITERATURE. In the general acceptance of the term a periodical is any publication other than a book or a daily newspaper. Usually the term comprises those serial publications the principal object of which is the circulation of interesting essays, tales, poems and useful information of a literary, scientific or artistic character. Periodicals are, furthermore, generally distinguished from newspapers by the greater care and reflection commonly bestowed upon their articles, and by their shape, which is always such that the numbers may be easily and conveniently bound and preserved in the form of books. Periodical literature embraces various classes of publications, those devoted to literature or criticism, and others to the sciences, the arts, or to special branches of knowledge or politics. Periodicals exclusively devoted to criticism are generally called reviews, and those whose contents are of a miscellaneous and entertaining kind magazines; but there is no great strictness in the use of the terms. The spread of knowledge during the 18th and 19th centuries, and the multiplication of books rendered it impossible for the scholar to inform himself of the progress of learning in various countries, or to purchase and read more than a small portion of the works published; hence the necessity for critical serials, magazines and other productions in the field of periodical literature. In the United States and in Great Britain most periodicals are issued weekly, monthly or quarterly. In France, Italy and Belgium the fortnightly is regarded as the natural form of the high-class periodical. Outside these countries the fortnightly is practically unknown. In Russia, Germany, Scandinavia and in Spain and Portugal the periodicals are generally monthly. The periodical had its genesis in France in 1665, and Italy and Great Britain followed soon afterward. But rather than deal with the subject chronologically, it would seem better for the sake of convenience to tell the life history of the periodical by an arrangement into the principal countries.

American periodical literature dates from 1741, the year when Franklin issued the *General Magazine and Historical Chronicle* at Philadelphia; but it existed only six months, while the *American Magazine*, begun a few days earlier by Andrew Bradford and John Webbe, was still less successful, running no further than two monthly numbers. The Boston *News-Letter* (1704), the first newspaper in America, was a weekly until 1776. The other issues of the kind prior to the Revolution were the Boston *American Magazine and Historical Chronicle* (1743–47), the *Boston Weekly Magazine* (1743), the *Independent Reflector* (New York 1752–54), the *New England Magazine* (Boston 1758), which ceased after a few issues, the *American Magazine* (Philadelphia 1757–58), the *North American Magazine* (Woodbridge, N. J., 1758), the *American Magazine* (Philadelphia 1769), the *Royal American Magazine* (Boston 1774), and the *Pennsylvania Magazine* (Philadelphia 1775). Before the end of the century came the *Columbian Magazine* (Philadelphia 1786), the *American Museum* (1787), the *Massachusetts Magazine* (Boston 1789), the *New York Magazine* (1790), the *Farmer's Weekly Museum* (Walpole, N. H., 1793), the *United States Magazine* (Philadelphia 1796), the *American Universal Magazine* (ib. 1797), and the *Monthly Magazine and American Review* (New York 1799–1800), founded by the novelist Brown, but carried on afterward as the *American Review and Literary Journal* (1801–02). Early in the 19th century came the *Port Folio* (Philadelphia 1801–27), founded by Joseph Dennie; the *Literary Magazine and American Register* (ib. 1803–08); the *Anthology and Boston Review* (1803–11), the forerunner of the *North American Review;* the *Monthly Register* of Charleston (1805) was the first periodical produced in the South. Altogether there were 27 periodicals appearing in the United States during 1810. The *Analectic Magazine* (Philadelphia 1813–20) was for a time edited by Washington Irving; the *New York Weekly Museum* appeared in 1814, but it was not till 1824 that the first periodical worthy of the city was founded in the *Atlantic Magazine,* which soon became the *New York Monthly Review.* The *New York Mirror* (1823–42) counted N. P. Willis among its editors; *Graham's Magazine* (1840–50) enjoyed a large circle of readers; the *Knickerbocker* (New York 1833–60) rose to great influence and prosperity. The *Southern Literary Messenger* (Richmond 1834) was a vehicle for some of Poe's finest criticism. The *Dial* (Boston 1840–44), the mouthpiece of the Transcendentalists, was edited successively by Margaret Fuller and Emerson; the *Illinois Monthly Magazine* (Vandalia 1830–32) was the first Western periodical, principally the work of one man, James Hall, who later for three years conducted the *Western Monthly Magazine. The Independent* started in 1848 and absorbed *Harper's Weekly* in 1916. *Putnam's Monthly Magazine* ran with great popularity in New York from 1853 to 1870, when it merged into *Scribner's Monthly,* which later became the *Century Magazine. Putnam's* was revived in 1906, combining with the *Critic* and *Literary World* as *Putnam's Monthly,* which was merged into the *Atlantic Monthly* in 1910. The last-named dates from 1857 (Boston); in 1878 it absorbed the famous *Galaxy,* which was founded in 1866 and had numbered Whittier, Longfellow, Lowell and Howells among its contributors and editors.

The review literature of the United States begins with the *American Review of History and Politics* founded by Robert Walsh (q.v.) in Philadelphia in 1811, a quarterly which existed two years; but one of the ablest and most permanent publications of this type has been the *North American Review* (1815), which has constantly maintained a high character both in style and critical excellence. The *General Repository and Review* (Cambridge 1812–13) had a very brief career, while Niles's *Weekly Register* (Baltimore 1811) ran till 1849. The *American Quarterly Review* (Philadelphia 1827–37) was another enterprise of Robert Walsh; the *Southern Quarterly Review,* an organ of Southern politics, ran from 1828 to 1832; revived in 1842, it existed till 1857 at Charleston, S. C. Other periodicals were the *Democratic Review* (1837–51), which absorbed the *Boston Quarterly Review* in 1842; the *American Review* (1845–49), which became the *American Whig Review* in 1850 and ended in 1852; the *Massachusetts Quarterly Review* (Boston 1847–50); *Lippincott's Magazine of Literature, Science and Education* (1868–71) underwent a slight alteration in title in 1871 and 1886 and was absorbed by *Scribner's Magazine* in 1916. The last-named periodical dates from 1887, and must not be confused with the former *Scribner's Monthly,* since 1881 known as the *Century Magazine.* A remarkable publication was *Brownson's Quarterly Review* (Boston 1844–56 and New York 1856–75), founded and conducted throughout its career by the late Orestes A. Brownson (q.v.) after severing his connection with the *Boston Quarterly Review.* The *Catholic World,* devoted to general literature and science, has appeared in New York since 1865, in which year the important weekly *Nation* also was first issued. The *National Quarterly Review* (New York 1860–80) and the New York *International Review* (1874–83) were popular in their day. A successful career was that of *De Bow's Commercial Review,* established in New Orleans in 1846, which under different sub-titles and after several breaks in continuity of issue ended in 1870. Still later appeared the *Arena* (Boston 1889–1909); *Cosmopolitan* (New York 1886); *Forum* (ib. 1886); *McClure's Magazine* (ib. 1893); *New England Magazine* (the third of that name, Boston 1884); *Overland Monthly* (San Francisco 1868); *Munsey's Magazine* (1884–85); *Everybody's* (New York 1899); *Metropolitan; Review of Reviews* (American edition, 1890); *Collier's Weekly* (1888); *Harper's Monthly* (1850) and *Harper's Weekly* (1857–1916); *Leslie's Weekly* (1855) and *Leslie's Monthly* (1876), now the *American Illustrated Magazine; The Outlook* (formerly *Christian Union* from 1870–93); *Saint Nicholas* (1873); *Youth's Companion; Country Life in America* (1901); *Woman's Home Companion* (1873); *Ladies' Home Journal* (1883); *Pictorial Review* and a host of other popular periodicals.

Increased revenue from advertisements enabled publishers to improve style and quality by enlisting highly-paid literary and artistic skill. The excellence of the illustrations to be found in American magazines is unsurpassed, while the stories and articles are with rare exceptions of a high order. The resuscitated *Munsey's Magazine* (as a weekly publication, in 1889) led the way in popularizing this form of literature. In not a few cases the intrusion of commercialism has led to a chaotic system of «make-up,» by which connected articles and stories are split up and scattered with columns and even pages of advertisement intervening.

The serious reviews cover almost every branch of topical and intellectual interest — art, science, engineering, history, commerce, industrialism, law, theology and medicine. Practically all the learned societies and educational institutions have their «journals» or «reviews.» Within recent years a number of new and original periodicals have appeared. *The Unpopular Review* (1914), a high-class publication of extraordinary merit, represents an accessible asylum for unpleasant truths and opinions; *World's Work, Review of Reviews* and *Literary Digest* are indispensable for the student of contemporary events. The publication by the *New York Times* of the monthly *Current-History* (1914), dealing with the European War, struck a new note in periodical literature by reproducing only authentic records without any comment. Among the latest periodicals may be mentioned *The Review* (New York 1919), a weekly devoted to political and general discussion; *Reconstruction: A Herald of the New Time* (New York 1919); *Harvey's Weekly* (1918) and *The Journal of Industrial Hygiene* (New York 1919), the first periodical devoted to the various phases of social and individual welfare included under that head.

Australia.— The British periodicals circulate largely in Australia. Chief among the native products are the quarterly *Imperial Review* (Melbourne), another of the same name published in Sydney; the *Australian Review of Reviews;* and the *Monthly Review* of New Zealand. In the large cities appear several illustrated topical weeklies, sporting journals and religious magazines.

Belgium.— From 1772 to 1818, the *Esprit des Journaux,* a literary miscellany of considerable value, was published in Belgium, but it was not until the separation from Holland (1829–31) that a distinctive periodical literature appeared. In early years of the 19th century the *Messages des Sciences* was edited by Saint Genois, while the *Nederdeutsche Letteroeffningen* appeared in 1836. Willems (q.v.) edited the *Belgisch Museum* from 1836 to 1846. The modern reviews cover the usual spheres of literature, science, history, politics, etc. See Belgium, *Newspapers and Literature.*

Canada.— To a large extent Canada depends upon the mother country and the United States for her periodical literature. Among the principal native publications are the *Canadian Magazine of Politics, Science, Art and Literature* (Toronto 1893); *Canadian Institute Transactions* (1852) and a large number of agricultural, engineering, mining and industrial publications. Several religious journals are published in Toronto and Montreal. *The Bystander,* a unique magazine edited, written and owned by the late Goldwin Smith, and *Once-a-Week* were shortlived Toronto publications.

England.— With the possible exception of the *Philosophical Transactions of the Royal Society,* which first appeared in 1665, the earliest English periodical seems to have been the *Weekly Memorials for the Ingenious,* the first number of which is dated January 1681. It was followed by several other periodicals, the most noteworthy being the *History of the Works of the Learned* (1699–1711); the *Memoirs of Literature* (1709, continued under different titles till 1743). The famous *Gentleman's Magazine* was founded in 1730. In the same century the nearest approach to the review, as differing from the magazine proper, was made by the *Monthly Review* (1749–1844), which was followed by the *Critical Review* (1756–1817), to which Smollett largely contributed; the *British Critic* (1793–1843); the *Anti-Jacobin Review and Magazine* (1798–1821). In 1809 appeared the *Quarterly Review,* successively edited by Gifford, Coleridge and Lockhart, who were assisted by the contributions of Scott, Southey, Croker, Heber, etc., who wrote in the Tory interest. In 1824 the *Westminster Review* was started by Bentham as the organ of utilitarianism and radicalism in politics, and has numbered among its contributors Bowring, Grote, Carlyle, John Sterling, Mill, Bain, etc. To provide critical literature at shorter intervals there was started in 1865 the *Fortnightly Review,* which for a short time appeared twice a month, since then only once. It was followed by the *Contemporary Review* (1866) and the *Nineteenth Century* (1877 — since 1901 the *Nineteenth Century and After*). Among the more recent periodicals of this class are the *National Review* (1883), a Conservative organ; the *Review of Reviews* (1890), giving analyses of the current periodicals generally; the *New Century Review* (1897); and the *Monthly Review* (1900). *The Athenæum* (1828) and the *Academy* (1869) are weekly journals devoted to the criticism of new books, paintings and sculpture, music and dramatic works and performances, with information on matters connected with literature, science and art. The *Saturday Review, Spectator and Speaker* (all weekly) combine the character of the review proper with more or less of that of the newspaper. The first English magazine, properly speaking, may be said to be the *Gentleman's Journal,* or *Monthly Miscellany,* commenced in 1692. The well-known *Tatler* (1709–10). *Spectator* (1711–12, revived 1714) and *Guardian,* as well as Johnson's *Rambler* (1750–51), were periodicals of a special kind. In 1731 appeared the *Gentleman's Magazine,* published by Cave, and contributed to by Johnson and other eminent writers. It brought a fortune to the lucky publisher, at whose death it was continued by Henry and Nichols. The success of Cave's venture brought out a host of imitators. The *London Magazine* (1732–84), the *European Magazine* (1782–1826) and the *Monthly Magazine* (1796–1829) were among the chief of this class which were originated in the 18th century. In 1832 *Chamber's Journal* made its appearance, marking the commencement of a new and more popular era. It was published weekly, but was also issued in monthly parts. *Cassell's Family Paper* (now known as *Cassell's Family Magazine*) was started in 1853. The old *Penny Magazine* (1832), published by the Society for the Diffusion of Useful Knowledge, deserves honorable mention. It was succeeded by the *Leisure Hour* in 1852, still one of the best illustrated sixpennies, published by the Religious Tract Society. Charles Dickens founded *Household Words* in 1850, and *All the Year Round* in 1859. A new era in this kind of literature was inaugurated by the shilling monthlies, some of them with excellent illustrations, the first being *Macmillan's Magazine* (1859); *Cornhill Magazine* (1860); *Temple Bar* (1860); closely followed by a number of others. Another step in the direction of cheapness was shortly afterward made by the publication of monthly magazines at sixpence, including *The Argosy, Good Words*, the *Sunday Magazine, etc.*, followed at a long interval by *Longman's Magazine, Murray's Magazine, English Illustrated Magazine* (1883); *Strand Magazine* (1891); *Idler* (1892); *Woman at Home* (1893); *Windsor* (1895); *Englishwoman* (1895); *Lady's Realm* (1896); *Pearson's Magazine* (1896); *Temple Magazine* (1896); *Girl's Realm* (1898); and *Wide World Magazine* (1898). Threepenny and fourpenny monthly magazines have become prominent in recent years. *Cosmopolis* (1896) has sections in French and Italian. There are innumerable religious magazines. The *Jewish Quarterly* is read by many who are not Jews. The *Empire Review* (1901) deals entirely with Imperial affairs. The *United Service Magazine* is a monthly, the *Navy and Army* a weekly. The *Badminton* is devoted to sport.

The European War was responsible for a number of new periodicals, such as the *Landmark* (1919), the monthly magazine of the English-Speaking Union; the *Balkan Review* (1919); the *New Europe* (1916), a valuable weekly; the *Anglo-French Review* (1919) represents life and letters in the two langauges; the *New Poland* (1919); the *New World* (1919) aims to strengthen the bonds of permanent friendship among all the allied and associated peoples; the *Reveille* (1918), devoted to the disabled soldier and sailor; and the *Anglo-Italian Review*. The other prominent periodicals include the *Round Table*, a quarterly review of the politics of the British Empire; *Science Progress; Journal of the Royal Asiatic Society*, the foremost authority on Orientalia; the *Hibbert Journal*, a quarterly review of religion, theology and philosophy; *The East and the West* (missionary problem); *Economic Journal; Modern Language Review; the Quest*, embracing a wide range of philosophic psychology; and journals issued by the Geographical, Statistical and numerous other learned societies. The *Edinburgh Review*, like the *Quarterly*, presents the mature reflections of serious thinkers on problems of the day.

France.— As already stated, the periodical originated in France in 1665, but the idea dates back to 1631, when Théophraste Renaudot, doctor, journalist and philanthropist, started the *Gazette de France*, a weekly political and literary review, which lived till 1792. In 1633–42 he published the *Bureau d'adresses*, a series of reports of the scientific conferences held at his home every Monday. In January 1665, Denis de Sallo, assuming the name of the Sieur de Hédouville, issued at Paris the first number of the *Journal des Savants*, generally regarded as the parent of critical reviews and the first periodical in France if not in the world. J. Doneau de Visé founded in 1672 the second literary periodical in France, the *Mercure Galant*, which gave reviews of poetry and the drama. Its title was changed in 1717 to the *Mercure de France*, and it was conducted with ability by Marmontel and others until 1818. The *Journal du Palais*, a legal periodical, made its appearance in 1672, and the first medical journal, *Nouvelles découvertes dans toutes les parties de la medicine*, was started in 1679. In 1701 a society of Jesuits at Trévoux began the *Memoires pour servir a l'Histoire des Sciences et des Beaux-Arts*, more commonly known as the *Mémoires de Trévoux*. It was characterized by the excellence of its critical judgments and by the zeal with which it combated anti-Jesuitical opinions; it lasted until 1767. The other noteworthy literary journals of France in the 18th century were the *Année Littéraire* of Fréron (1754–91); the *Magasin Encyclopédique*, begun in 1795, the second series of which was called the *Annales Encyclopédiques*, and the third the *Revue Encyclopédique* — it was suspended in 1832, and a last attempt was made to re-establish it by Didot in 1846, but failed. In the 19th century the *Revue Française*, the *Revue de Paris*, the *Revue Independante* and many more have appeared and been discontinued. But the *Revue des Deux Mondes*, begun in 1829, and from 1831 issued fortnightly, was marked by an ability which rendered it permanent, and placed it in the front rank of the critical journals of the world. In 1852 appeared the *Revue Germanique*, devoted to German literature; the *Revue des Races Latines* (1857), appropriated to the arts and letters of those nations having a Latin origin; and the *Revue Européenne* (1859). Other important French periodicals include the *Nouvelle Revue, Revue Politique et Littéraire, Grande Revue, Revue de Famille, Revue Illustrée, L'Illustration, Revue des Lettres et des Arts, Figaro*, etc. To the admission of poetry and tales into the reviews, and to the publication by almost every newspaper of a literary *feuilleton* or serial, must be ascribed the comparative paucity in France of serials exactly corresponding to the English and American magazines.

Germany.— The first periodicals in the German language were written in the form of dialogues; they were the *Monatsgespräche* (1688–89) and the *Monatliche Unterredungen* (1689–98). Under the title of *Gelehrte Zeitung* almost every large town had at some period of the 18th century its literary journal, such, for instance, as those published at Frankfort (1736–86), Halle (1766–92), Gotha (1774–1804) and others. But of more importance than all these was the *Göttinger Gelehrte Anzeigen*, begun in 1739. In 1766 Nicolai founded the *Allgemeine Deutsche Bibliothek*, which lived over 49 years; the more valuable *Briefe, die neueste Literatur Betreffend*, supported by Lessing, Mendelssohn and others, had an existence of only six years (1759–65). Among the other notable periodicals established in the 18th century and in the beginning of the 19th were the

Allgemeine Literatur-Zeitung (1785–1848); the *Jenaische Allgemeine Literatur-Zeitung* (1804–48); to which the great literary circle of Weimar, of which Goethe was the centre, contributed. The *Leipziger Literatur-Zeitung* (1800), the *Wiener Jahrbücher der Literatur* (1818), *Hermes* (1819), and the *Jahrbücher für Wissenschaftliche Critik* (1827). The leading critical authorities are the *Heidelberger Jahrbücher der Literatur* (1808), the *Deutsche Vierteljahrsschrift* (1838), modeled upon the English review, and the *Gelehrte Anzeigen.* Of a more popular tone are the *Blätter für Literarische Unterhaltung* (1833), the *Deutsche Museum* (1852), the *Grenzboten* (1841), *Westermanns Monatshefte* (1855), and many more of the magazine kind. The *Illustrirtes Familien-Journal* of Leipzig is of the *Penny Magazine* school, and enjoys a very large circulation. Of more recent date are *Die Gegenwart* (1872), the *Literaturzeitung* (1874), the *Deutsche Rundschau* (1874), *Die Neue Zeit* (1872); *Nord und Süd* (1878), *Die Nation* (1888), *Die Zukunft* (1892) and *Preussische Jahrbücher.*

Holland.— In 1684 appeared the *Mercure Savant* at Amsterdam, and in the same year the *Nouvelles de la Republique des Lettres,* which was continued with great success until 1718. Then came the *Boekzal van Europa* (1692–1708), which was excelled by the *Republijk der Geleerden* (1710). J. van Effen produced his *Hollandsche Spectator* (1731) with marked success; but a new era in criticism was introduced in 1761 by the *Vaderlandsche Letteroefningen.* The *Allgemeene Konsten Letterbode* (1788) maintained for many years a high rank. The *Recensent* (1803), superseded by the *Nieuwe Recensent,* proved itself a powerful rival to the *Letteroefningen.* Other periodicals are the *Nederlandsche Museum* (1835), the *Tijdstrom* (1859) and the *Navorscher.*

India.— The best known of early periodicals in India were the *Calcutta Monthly Register* (1798); the *Oriental Magazine and Indian Hurkaru,* which began at Madras in 1819; the *Madras Miscellany;* the *Calcutta Review* (1844), a valuable existing quarterly; and the *Bombay Quarterly Review,* which dated from 1855. At Singapore the *Journal of the Indian Archipelago* began in 1847, while the *Chinese Repository,* begun by Morrison at Canton, was from 1832 to 1851 filled with valuable articles relating chiefly to literature and history. The *New China Review* (Hongkong 1919) is a successor to the long defunct *China Review.* Today India has the *Calcutta Review* (quarterly) and the monthlies, the *National Magazine,* the *Indian Magazine and Review* and *Allahabad Review.*

Ireland.— The *Literary Journal* was published in Dublin in 1744, the first periodical in Ireland. In 1836 the *Dublin Review* was established by O'Connell and his friends as the organ of the Roman Catholic party. The *New Ireland Review* appeared in 1894. *Studies* is a quarterly review of letters, philosophy, science and Irish questions. *The Irish Monthly* is a religious publication of considerable literary merit. The *Leader* (weekly) is perhaps the most spirited publication of the new Ireland. An *Claidheamh Soluis* (The Sword of Light) is the official organ of the Gaelic League. There are many lesser periodicals in Cork and Dublin.

Italy.— In 1668 the *Giornale de letterati* was commenced at Rome by Nazzari, and published until 1679. Under the same title literary periodicals were afterward issued at Parma (1686), at Venice (1719), at Florence (1742), and finally at Pisa in 1771. The *Biblioteca volante* (1676) was of a less solid character, but the *Novelle letterarie,* published for several years subsequent to 1740. was marked by much erudition. Distinguished at a later period were the *Biblioteca Italiana* (1816) of Milan; the *Antologia* (1821) of Florence; the *Giornale Arcadico* (1819) of Rome; the *Giornale Enciclopedico* (1806) of Naples, which was followed in that city by the *Progresso delle Scienze* (1833), the *Museo di Scienze e Letteratura,* and several minor ones, like the *Poligrafo* (1811), *Magazzino Pittoresco,* and the popular *Album* (1824) of Rome. The chief critical serials are the *Rivista Contemporanea* (1852) of Turin; the *Politecnico* (1839) of Milan, which was suppressed in 1844, and revived in 1859; the *Giornale degli Eruditi* (1883); the *Nuova Revista Internazionale* (1879) and the *Revista Internazionale* (1883).

Russia.— In point of size the Russian periodicals excel all others. Among the early publications were the *Yezhemyesyatchnüya Sotchineniya* (Monthly Works), edited by Müller from 1755 to 1764. Soon afterward commenced Sumarakoff's *Industrious Bee* (1759) and Keraskoff's *Leisure Hours* (1762). Superior to these, however, was the *Vyestnik Yevropi* (European Messenger), founded in 1802 by Karamzin the historian and subsequently (1808) edited by the poet Zhukovsky. This was followed by the *Russkoi Vyestnik* (Russian Messenger), conducted 1808–20 by Glinka, Gretch and Polevoy; after having been suspended for some years it was revived 1856 in Moscow by Katkov. One of the ablest publications was the *Synn Otéchestva* (Son of the Fatherland). founded in 1812, with which was united in 1825 the *Sévernüi Arkhiv* (1822) or *Northern Archives.* This combined publication came to an end in 1840; the newspaper *Synn Otéchestva* of Petrograd is of more recent origin. Other periodicals past and present include the *Biblioteka dlya Chteniya* (1834) or *Circulating Library;* the Moscow *Russkaya Müssl* (*Russian Thought*); *Zhurnal Ministerstva Narodnava Prosveshtchéniya,* a monthly *Journal of Public Instruction; Vyestnik Vospitaniya* (*Educational Messenger*); *Mir Iskusstva* (*Art World*); *Russkoye Bogatstvo* (*Russian Wealth*), a literary monthly; *Mir Bozhi* (*God's World*); *Russki Arkhiv; Russkaya Starinâ* (*Russian Antiquity*), an archæological review; *Baltische Monatsschrift* (*Baltic Monthly*) in the German language, and the historical journal, *Istoricheski Vyestnik.* The former Russian Imperial Historical Society issued a periodical or *Zbornik* (magazine).

Scotland.— The long defunct *Scots Magazine* first appeared in 1739, and in 1755 there was started in the capital an *Edinburgh Review* which lived only a year, its second number being also the last. Since then there had been no critical journal in Scotland at all till the appearance, on 10 Oct. 1802, of the well-known *Edinburgh Review or Critical Journal* (q.v.) —

«to be continued quarterly.» It is now published by Longmans in London. William Blackwood founded the famous *Blackwood's Edinburgh Magazine* in 1817, which soon took rank as the first serial of the kind in the United Kingdom. Among its contributors were Prof. John Wilson («Christopher North»), James Hogg, Lockhart, Wordsworth, Coleridge, Lamb, Maginn, De Quincy, Landor and other prominent literary masters while in later years Professor Aytoun, Jerrold, Lord Lytton, George Eliot, etc., have enriched its pages. In 1830 came *Fraser's Magazine* which, after many vicissitudes under numerous editors, is now extinct, while *Blackwood's* still flourishes. It was in *Fraser's* that Carlyle's ‘Sartor Resartus’ was first published (1833–34).

Spain and Portugal.— The earliest periodicals in Spain were the *Diario de los Literatos* (1737), the *Pensador* (1762), the *Seminario Erudito* (1755), the *Memorial Literario* (1784–1807) and the *Variedades*, which acquired a considerable reputation. The *Cronica Cientifica y Literaria* (1834) subsequently became a political sheet. The *Censor* (1820) was for some years the best Spanish periodical; it was finally superseded by the *Revista Española* (1831), which successively changed its title to *Revista Europea* and *Revista de Madrid*. It was not till after the revolt against Espartero (1841–43) that periodical literature began to flourish in Spain. For a time there existed a journal devoted to bull-fighting. Later came the *Cartas Españolas, Antologia Española* (1848), the *Revista de España*, the *Seminario Pintoresco* and the *Revista de Ambos Mundos*. The *Journal da Coimbra* in the early part of the 19th century was the first and for a long time the only literary organ of which Portugal could boast. In 1837, however, the *Panorama* was founded, and in 1842 the *Revista universal Lisbonense* was established. Other publications of the literary class are the *Journal da sociedade dos amigos das letteras* and the *Bibliophilo*.

Sweden.— The *Svenska Argus* (1732) was the earliest notable addition made by Sweden to learned periodical literature. In 1742 Celsius founded the *Tidningar om den lärdes Arbeten;* but the first comprehensive critical journal was the *Svenska Mercurius* (1755), the *Phosphorus* (1810), and the *Iduna* (1811). Both wielded a powerful influence in the literary circles of Sweden, and originated two different schools of poetry and criticism. Among other periodicals were *Polyfem* (1810), *Svea* (1818), *Journal for Literaturen* (1809), *Skandia* (1833), *Literatur-Foreningens Tidning* (1833), and the *Literaturblad* (1838). The best of a later date are the *Tidskrift for Literatur* and *Nordisk Tidskrift*.

Switzerland.— In Switzerland the *Bibliothèque Britannique* (1796–1815) and its successor, the *Bibliothèque Universelle* (1816), which was published in two parallel series, one scientific and the other literary, were widely circulated both at home and abroad. The *Revue Suisse* has been conducted with much success at Neuchâtel since 1837.

See Catholic Press of America; De Bow; Medical Journalism; Newspapers, American.

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PERIŒCI, pē-rī'ō-kī, the term used in Laconia and other ancient Dorian lands to designate the descendants of the ancient inhabitants of those countries. The Periœci were freemen, and strictly speaking not vassals, much less serfs, like the Helots, but they were considered inferior to the Spartans in regard to social rank and political rights. They were only allowed to occupy the inferior lands, and were employed as artisans, merchants and sailors, and had at times a minor share in the government. At some periods they were allowed to intermarry with the Dorians, and they served in war even as hoplites, though they were compelled to form corps of their own, not being allowed to serve in the same corps with the Dorians.

PERIOPTHALMUS. See Mud-skipper.

PERIOSTEUM, the fibrous membrane investing the bones, and serving as a medium for the transmission of the nutritive blood vessels of the bone. It firmly adheres to the surface of bones, save at their gristly or cartilaginous extremities, and it becomes continuous with the tendons or ligaments inserted into bones. In young bones the periosteum is loosely attached to the shaft, and between the growing bone and the periosteum a layer of soft blastema or formative matter is interposed, this layer contributing to the formation of new bone on the outer surface of the structure. As the bone advances in development, and in adult life, the periosteum grows much thinner, and it becomes in time more or less firmly adherent to the bone. When the periosteum, through disease or injury, becomes affected, the blood-supply and nutrition of the bone suffer, and in consequence the bone-tissue dies or becomes necrosed, and is exfoliated or thrown off in the form of a sequestrum. The alveoli or sockets of the teeth are lined by periosteum, and this membrane is reflected on to the tooth, and invests it as far as the neck. The periosteum at the neck of the tooth merges with the fibrous structures of the gums. When a bone is fractured the periosteum plays an important part in the repair of the injury, new osseous material being deposited by the membrane. It is liable to certain diseases, such as actinomycosis, tumor, tuberculosis, etc. See PERIOSTITIS.

PERIOSTITIS, pĕr-ĭ'ôs-tī'tĭz, inflammation of the membrane encasing a living bone, or the periosteum (q.v.), a painful ailment frequently developed by sudden exposure to cold after being heated. It is exhibited in two forms, acute and chronic. In the acute form suppuration commonly occurs, with the result of separating the membrane from the bone structure, in which case it is liable to suffer necrosis. This condition calls for prompt removal of the pus. Various constitutional diseases, such as scrofula, syphilis, tuberculosis or gout, may produce chronic periostitis. The chronic form usually excites a thickening of the bone at the point beneath the affected membrane. The diagnosis that detects the originating disease will also lead to the indicated treatment, which is to be applied chiefly to that cause of the periostitis.

PERIPATETIC PHILOSOPHY, the philosophy of Aristotle, which received this name from the shady avenues (Greek *peripatoi*) in which that philosopher was accustomed to walk with his disciples, while expounding to them his doctrines. See ARISTOTELIANISM.

PERIPATUS, a genus of animal, somewhat resembling the cylindrical myriapods, first described as mollusks, then transferred to the annelids, and now regarded as arthropods, since Moseley discovered that they respired by tracheæ, resembling those of the insects. The animals have a wide but discontinuous distribution, being found in South and Central America, the West Indies, Cape of Good Hope, the Kongo, Australia, New Zealand, Melanesia and Malaya, living in decaying wood and feeding upon the insects found there. This distribution is indicative of great antiquity, but we cannot hope to find fossils of the group since all hard parts are lacking. The animals have cylindrical, worm-like bodies, without external segmentation, supported on numerous fleshy feet, the number varying with the species. The head has a pair of primitive eyes, a pair of ringed antennæ and a pair of jaws, while on either side of the mouth are the openings of a pair of slimeglands, the secretion of which is exceedingly sticky. The nervous system is very primitive. The respiratory organs, as mentioned above, are air-tubes or tracheæ which, unbranched, arise in scattered bunches from the skin. The excretory system is much like that of the annelids and consists of a pair of *nephridia* in each segment. The sexes are separate; the reproductive organs opening below just in front of the terminal anus. The young are born alive. The different species show great differences in their development. There is great uncertainty as to the position of these forms, which are usually regarded as a class variously called *Malacopoda, Onychophora* or *Protracheata*. By some they are regarded as the stock from which the insects have sprung, by others the resemblances between the *Malacopoda* and *Insecta* are regarded as homoplastic. The distinctly arthropod features of *Peripatus* are limbs modified as jaws, openings from the heart into the pericardium, the absence of a true body-cavity around the viscera and blood-sinuses surrounding the viscera. The nephridia and the presence of cilia in the generative organs are annelid characteristics. Other features in which *Peripatus* is unique among arthropods are the distribution of the tracheæ, the absence of a second pair of jaws, the reproductive system, the texture of the skin and the similarity of the body-segments behind the head. The original genus *Peripatus* has recently been divided by some authorities into several genera. Consult Sedgwick, A., article on Peripatus in 'The Cambridge Natural History' (London 1895).

PERISCOPE, a term first applied to spectacles with concavo-convex glasses, constructed to increase the distinctness of objects when viewed obliquely. It now designates an apparatus with reflecting prisms at opposite ends of a tube so that an observer beneath the surface of water or otherwise concealed may make observations. It was much used in the trenches during the European War of 1914–18, but its employment on land was eclipsed by its development and use as the eye of the submarine. Here it was developed into a strong rigid machine enabling the submarine commander to scan the seas round about while retaining his vessel submerged. The magnification in the larger types reached as high as six diameters. See SUBMARINE.

PERISSODACTYLA. See UNGULATA.

PERISTALSIS, vermicular or peristaltic motion or contraction of the stomach and intestines; a kind of undulation or worm-like movement beginning at some point in the wall of a tubular viscus and extending from above downward toward or to the end of the hollow organ. Its object is to propel forward the contents of the viscus. The movement is a series of gentle but strong contractions, associated and alternating more or less with contractions of the longitudinal fibres. Peristalsis in the stomach and intestines pushes the food along so that it can come in contact with the digestive juices, and its waste be cast out of the body. In very thin persons peristalsis of the small intestine is sometimes so conspicuous that the ignorant have inferred the presence of a live snake within the abdomen. Food, after it leaves the grasp of the constrictor muscles of the pharynx, is pushed through the œsophagus or gullet and into the stomach by the peristaltic movements of the œsophagus. Urine and sometimes calculi are propelled from the kidneys into the bladder by the peristalsis of the walls of the ureters. Sometimes there is an inverse action of the muscular fibres of a hollow viscus, producing anti-peristalsis. Peristalsis is involuntary, and mainly under the control of the ganglionic division of the nervous system, and may continue for a time after death. The presence of irritating substances cause abnormal peristaltic motion, which may then be painful, spasmodic or violent. See DIGESTION.

PERISTEROPODES, a division or suborder of the *Gallinæ*, including the curassows and mound-builders, distinguished by having the hind toe long and on a level with the others as in pigeons. It is contrasted with *Alectoropodes*, or true fowls, which have the hind toe short and elevated.

PERISTYLE, *in architecture*, a name given to a range of columns surrounding anything, as the cells of a temple, or any place, as a court or cloister. It is frequently but incorrectly limited in signification to a range of columns round the interior of a place. In the Roman house the peristyle was a room somewhat like the atrium, but larger, containing an open space surrounded by pillars.

PERIT, Pelatiah, American merchant: b. Norwich, Conn., 23 June 1785; d. New Haven, Conn., 8 March 1864. He was graduated from Yale in 1802, taught for a year, entered business in Philadelphia and in 1809 settled in New York where he engaged with a firm of shipping merchants. He was a member of the firm in 1817–63 and in 1853–63 was president of the Chamber of Commerce. In that position he rendered important service to the government by leading in the movement which put the United States treasury on a basis to meet the heavy expenses of the Civil War. In 1857 he served as a police commissioner and did much to restore the security of New York City, which was endangered by the contest between the «Municipal» and the «Metropolitan» police. He was a benefactor of many educational and charitable institutions and was deeply interested in Christian missions.

PERITONEUM, the most extensive serous membrane in the body. It lines the abdominal cavity in mammals, and in general the body-cavity of other vertebrates. In man it forms a closed sac; in the female it communicates with the interior of the uterus through its Fallopian tubes. It partially invests all the viscera in the abdominal and pelvic cavities, forming the visceral layer of the peritoneum; the portion reflected upon the internal surface of the walls of the abdominal and pelvic cavities is the parietal layer. The cavity enclosed by these two layers is the peritoneal cavity, which in health contains just sufficient serous fluid to moisten its surfaces. The free or inner surface of the peritoneum is moist, smooth and glistening and covered by a layer of flattened endothelial cells; its attached or outer surface is rough, being connected to the viscera and the walls of the abdominal and pelvic cavities, by means of the subperitonaeal alveolar tissue. Various reflections of the peritoneum, such as the broad folds known as the mesenteries (the mesentery proper, the mesocolon, etc.) and the narrow ones forming ligaments (of the liver, spleen, bladder and uterus), hold the viscera in position and enclose vessels and nerves, while admitting free movement of certain of the viscera.

The pancreas, kidneys and suprarenal capsules lie behind the peritoneum; the liver, stomach, spleen, a large part of the small and large intestine and the uterus and ovaries are almost entirely invested by it; the remaining viscera are partially invested. Duplicatures of the peritoneum extending from the stomach to adjacent organs are called omenta. The largest peritoneal fold is the great omentum, enfolding the transverse colon and reaching in front of the small intestine as low down as the pelvis, forming a sort of apron. A fold of peritoneum between the rectum and vagina forms a pouch or cul-de-sac known as the rectovaginal pouch. In the male fœtus a lengthened pouch of peritoneum accompanies the testicle at the time of its descent, the upper part of the pouch becoming obliterated just before birth; in the female there is a similar pouch, sometimes persistent.

The peritoneum may become inflamed from various causes, constituting the disease known as peritonitis. It may be injured by contusions and wounds of various kinds, or it may be the seat of morbid formations, such as deposits of fat in the great omentum, or of new growths, tuberculous and cancerous. Peritonitis is always serious and in its acute form, especially if extensive and associated with rupture of the intestine or other viscera, frequently proves fatal. An injury to the peritoneum from without may not prove dangerous unless it induces hemorrhage or severe inflammation. But the introduction of foreign material, such as food, fæces, calculi, pus and bile, into the peritoneal cavity by perforation and rupture is a grave complication. Chronic inflammations of the peritoneum and some acute forms sometimes produce false membranes which bind some of the abdominal and pelvic viscera, restraining their necessary movements and inducing chronic and troublesome disorders.

Surgeons formerly did not consider it a legitimate operation to open the abdomen for the removal of diseased organs, etc., so great was the dread of establishing a severe inflammation. At the present time many lives are saved by such operations. With antiseptic precautions, the opening of the peritoneal cavity is now considered a reliable mode of procedure in many cases. Consult ‹Reference Handbook of the Medical Sciences› (Vol. VII, New York 1916).

PERITONITIS, inflammation of the peritoneum. It is either acute or chronic. The acute form is always serious and often quickly fatal; the chronic is sometimes of little consequence, sometimes grave, but may end in great improvement or practical recovery. The symptoms and prognosis of this disease depend upon the extent and degree of the inflammation, whether it is general or local, circumscribed and partial, and also upon the cause, predisposing or exciting. The diagnosis, except in typical cases, is sometimes obscure; the disease may be latent, or subacute at the outset and for a considerable period. The principal dangers of the disease are great depreciation of the vital forces, with impairment of the blood in extensive inflammation; shock to the nervous system from perforations; and impairment of the necessary movements of abdominal organs from fibrinous exudations. Perforation is the result of an ulceration and may occur from ulceration of the small intestine in typhoid fever, chronic ulcers of the stomach, ulceration in dysentary and in appendicitis, ulceration of softened solid abdominal organs, of cysts, of aneurismal sacs, of pulmonary abscesses through the diaphragm, etc. Sometimes the localized thickening of the peritoneum resulting from the inflammation of a threatening ulceration prevents a perforation and the already existing peritonitis becomes less dangerous. Urine and unhealthy pus are especially dangerous, if introduced into the peritoneal cavity. Idiopathic or spontaneous peritonitis, resulting from such causes as cold, or excessive eating or drinking, is rare, though it sometimes occurs. Acute peritonitis is more common among women than among men, as the result of extra-uterine pregnancy, or ovaritis, or the extension of gonorrhæal or other forms of inflammation from the uterine cavity, etc. It is usually due either to wounds, perforation from ulceration or severe injury, or to obstruction or irritation, the result of the presence of morbid products. While the peritoneum is frequently cut or aspinated by the surgeon with safety, sometimes a slight penetrating wound, especially if air and septic material accompany it, proves fatal. Violent blows upon the abdomen may not only excite peritonitis, but may rupture solid or hollow viscera, causing blood and other foreign material to escape into the peritoneal cavity, usually with fatal results. Distention of the peritoneal sac in ascites, morbid deposits, such as cancer and tubercle, mechanical pressure or friction, extension of a local inflammation of the uterus, liver, etc., or from a pleurisy, a pericarditis or a strangulated hernia, are among the causes of peritonitis. The internal marks or characteristics of acute peritonitis are hyperæmia and infiltration, more or less marked, of the peritoneum; sometimes small extravasations of blood; serous effusion containing flakes of fibrin; sometimes pus in considerable quantity, especially in the pelvic cavity, occasionally dangerously infectious; and thin layers of soft fibrinous material coating one or more of the viscera; or firm fibrinous exudations. The first symptom usually noticed by the patient is pain in one spot, which pain gradually spreads and becomes intense and is aggravated by movements either of the bowels or the body. The pain may be preceded by shivering. The patient lies for the most part upon the back with the knees drawn up to relieve tension. The abdomen gradually becomes distended with gas and is tympanitic; soreness and tenderness are more or less marked; the pulse reaches to 120 or more and is small; the tongue is very red and is covered in part with fur; thirst and vomiting are not infrequent; bowels are usually constipated, but sometimes there is diarrhœa; there is more or less difficulty in urinating; fever is high; the face wears an anxious expression; and perspiration is sometimes profuse. A chill in the course of the disease indicates either a perforation or other serious complication. In latent acute peritonitis pain may be slight and there may be no tympanites.

While acute peritonitis is a very dangerous disease, especially if perforation occurs, its treatment is now much more successful than it was before 1842, when Alonzo Clark, in the United States, demonstrated the power of opium to relieve pain and calm nervous and muscular irritability. Absolute rest in bed, hot applications, easily digested food, attention to the tongue, bowels and bladder and quiet surroundings are additional remedies.

Chronic peritonitis may be the result of an acute peritonitis, but in the majority of cases is due to the deposit of tubercular material, mostly in the mesenteric and intestinal mucous glands, of cancerous material in abdominal organs, or to chronic ulcerations of the stomach, to renal disease, etc. The history is obscure; the symptoms are a feeling of tightness or of dragging; a dull pain, aggravated by movement; a poor appetite; more or less diarrhœa and constipation; dryness of the skin and its earthy hue; gradual emaciation, bed-sores, etc. The principal evidence of chronic peritonitis is fibrinous exudation. The prognosis is, as a rule, unfavorable if the inflammatory products are extensive. The disease may last a long time.

Bright's disease, low forms of fever, erysipelas and a tuberculous tendency are predisposing causes of peritonitis. Tuberculous peritonitis is often cured by opening and exposing the tuberculous masses to the air and washing out with a saline solution. Puerperal peritonitis is especially to be dreded because of the great mortality attendant upon it.

PERITYPHLITIS, inflammation of the connective tissue behind and around the cæcum. The most frequent cause is an extension of inflammation from the cæcum (typhlitis) or the vermiform appendix, but it may result from the extension of inflammation from more distant parts of the body. External injury, such as blows, kicks or severe compression of the lower part of the body, are some of the exciting causes. Prognosis depends upon the severity of the inflammation and the local lesions resulting. If an abscess forms and discharges into the peritoneal cavity, death results. The diagnosis of perityphlitis is more or less difficult. See CÆCUM; COLON; APPENDICITIS.

PERIWINKLE, a genus (*Vinca*) of the family *Apocynaceæ*. The species, of which 10 have been described, are erect or trailing herbs or sub-shrubs with opposite leaves, and rather large axillary, solitary, salver-shaped flowers. Four species are cultivated in gardens and greenhouses. The common periwinkle, running, blue, or trailing myrtle (*V. minor*) is a hardy, evergreen, trailing herb common in shady cemeteries, gardens, etc. It is typically blue-flowered, but some of its varieties have white, others pink flowers. Some have variegated foliage. The larger periwinkle (*V. major*) is larger in stem, leaf, flower, etc., than the preceding species, but is less hardy in the north. Some of its variegated varieties are exceedingly popular for window-boxes, hanging baskets and vases, being able to withstand untoward conditions with respect to heat and drought. The Madagascar, Cape or rose periwinkle (*V. rosea*), is a tender, ever-blooming species cultivated in greenhouses. It is also popularly called old maid. The herbaceous periwinkle (*V. herbacea*) is a hardy species which sheds its leaves in winter. The flowering shoots which appear in spring are followed by leafy stems that root at the tips. It is valued for its free-flowering qualities. All these species are readily propagated from cuttings or seeds and will thrive in almost any kind of soil.

PERJURY, *in law,* is an offense defined as intentionally false testimony given under oath on a point material to the question by one required by law to state the truth in any judicial proceedings. In a number of jurisdictions statutes are in effect which provide that sworn testimony or declarations in other specified conditions shall be considered perjury. Whether or not one testifies voluntarily or under compulsion does not affect the status of perjury. Under a Federal statute one is guilty of perjury who falsely states, certifies to or declares before a tribunal, or a person authorized under a law of the United States, relative to any material matter which he does not believe to be true. Generally perjury is a misdemeanor and punishable as such, but in some States it has been made a felony; the offense takes place immediately upon completing the false testimony before a court, person or officer, lawfully authorized to take same; and one is not liable for perjury where an oath is not required by law, or upon a false statement made under mistake, or unusual circumstances such as excitement, or fear, or without knowledge of the falsity of the statement. Whether injury results from the false oath, or the same is credited or not, is not material to the offense. Perjury must be proven beyond all reasonable doubt and cannot be established by the proof of a single witness. The punishment therefor must be only as provided by law, and is usually prescribed by statute. Damages cannot be recovered in a civil action on account of the commission of perjury, or procuring another to commit perjury. A person procuring another to commit perjury is guilty, if the perjury is actually committed, of subornation of perjury; this may be proven by one witness, and the person so found guilty may be convicted. If one attempts to procure another to commit perjury, but perjury is not actually committed, he is guilty of incitement to commit perjury and may, under some statutes, be indicted and punished.

PERKASIE, pĕr'ką-sĭ, Pa., borough of Bucks County, situated on the Philadelphia and Reading and the Lehigh Valley Traction Company railroads, 35 miles north of Philadelphia. It is a thriving industrial centre, with brickyards, tile works, silk mills, cigar factories, wire, tag and label works, etc. The borough owns and operates the electric-lighting plant. Pop. 2,779.

PERKIN, Sir William Henry, famous English chemist: b. London, 12 March 1838; d. there, 14 July 1907. His title to fame is mainly based on his greatest and earliest achievement, the discovery of the first aniline color, in 1858. Educated at the City of London College, he entered the Royal College of Chemistry in 1853. Two years later he was assistant to Dr. Hofmann in his research laboratory. His aniline discovery was made whilst conducting some experiments at home dring the Easter vacations. The object he had in view was the artificial formation of quinine; what he found, however, was the aniline purple or mauve color, which was destined to lay the foundations of the great coal-tar color industry. He made numerous experiments at Pullar's dye works at Perth, and finally left his college to devote himself entirely to the development of his discovery, which he patented when he was 18 years old. With the assistance of his father and his brother he started the firm of Perkin and Sons and erected some works near London, where the new dye was successfully produced in 1857 and supplied to silk dyers and calico printers. He also discovered several other coal-tar coloring matters, and when Liebermann and Graebe discovered the formation of alizarine from anthracene in 1868, Perkin devised two processes to put that discovery to practical uses. He was the first, in 1869, to manufacture alizarine commercially, and also found that with this artificial product another coloring matter was associated, namely, anthra-purpurine, a valuable ingredient in varying the shades of pure alizarine. In 1873 he retired from technical work to continue his researches in pure chemistry, on which branch he published numerous papers, e.g., the artificial formation of glycocine, a derivative of gelatine (1859), and tartaric acid (1861). His first papers on salicylic aldehyde appeared in 1867, in which he proved that his substance was also a phenol, a discovery that led to the artificial formation of coumarin and other odoriferous substances, an event that marked the beginning of the artificial perfume industry. By the process known as «Perkin's Reaction» it became possible to produce cinnamic acid technically for the artificial production of indigo by the method of Bayer. Perkin's valuable services were universally recognized. The jubilee of his aniline discovery was celebrated in 1906, on which occasion he was knighted by King Edward and likewise received honorary degrees from the universities of Oxford, Columbia (N. Y.), Johns Hopkins, Heidelberg, etc. He was presented with the Hofmann medal by the German Chemical Society and the Lavoisier medal by the French Chemical Society. A sum of $13,500 was subscribed by chemists and handed to the Chemical Society (London) to found a «Perkin Memorial Fund» to be applied to the encouragement of research in the coal-tar and allied industries. The English Society of Dyers and Colourists instituted the «Perkin medal» for distinguished services to chemical industry, and the American memorial committee founded a Perkin medal for American chemists. The three sons of Sir William Perkin followed in their father's footsteps, and each enjoys an international reputation for achievements in the domain of science.

PERKINS, Charles Callahan, American art critic: b. Boston, Mass., 1 March 1823; d. Windsor, Vt., 25 Aug. 1866. He was graduated from Harvard in 1843, studied music and art in Europe and became widely known as an art critic and writer and was one of the first to practise the art of etching in this country. He was elected to the French Legion of Honor in 1867, corresponding member of the French Institute in 1868, was president of the Boston Art Club in 1869–79, one of the founders of the Boston Museum of Fine Arts, and occasionally he conducted the performances of the Handel and Haydn Society of which he was president in 1875–86. He was critical editor of Champlin's 'Cyclopædia of Painters and Paintings' (1886–

87) and wrote 'Tuscan Sculptors' (1864); 'Art in Education' (1870); 'Raphael and Michelangelo' (1878); 'Ghiberti et son Ecole' (1886), etc.

PERKINS, Elisha, American physician: b. Norwich, 16 June 1741; d. 6 Sept. 1799. He began the practice of medicine with his father at Plainfield, Conn. He invented, about 1796, some instruments which he named metallic tractors, for the cure of local pains, inflammations and rheumatism. The tractors, he claimed, were of peculiar and secret composition, but it is asserted that one was of iron, the other brass; they were three inches long and pointed. In use they were drawn downward over the affected part of the patient for 20 minutes. The wonder is that many learned men in the United States and abroad approved the process. It was known as «Perkinism,» and 12 physicians in Copenhagen (probably the ancestors of those who a century later received Dr. Cook!) tested it, and published a volume in its favor, giving details of its effects. Dr. Perkins' son published a book, in London, introducing the method; and there it inspired so much faith that a Perkinsian institution was opened, of which Lord Rivers was president. Recommendations were signed by many physicians and clergymen, and thousands of cures published. Heated discussions arose, and a satire, 'Terrible Tractoration,' was put forth by Thomas G. Fessenden, in defense of the tractors. The history of this supposed remedy belongs doubtless among the many illustrations of the power of the mental state over the physical. Dr. Perkins invented also an antiseptic, and visited New York in 1799 when he undertook to prove its efficacy during a yellow fever epidemic, but he himself fell a victim to the fever.

PERKINS, George Clement, American senator: b. Kennebunkport, Me., 23 Aug. 1839. He was reared on a farm; went to sea at 13, and was cabin boy and sailor until 1855, when he shipped before the mast on a sailing vessel bound for San Francisco, and on arrival there went to Oroville, where he engaged in mining. Subsequently he carried on a successful mercantile business in San Francisco and became interested in banking, milling, mining and the steamship business. He operated numerous ships on Pacific Ocean from Alaska to Mexico. In 1869–76 he was a member of the California senate and in 1879 to 1883 was governor of California. On 24 July 1893 he was appointed United States senator to fill the vacancy caused by the death of Leland Stanford and on 8 Aug. 1893 was elected for remainder of term. Mr. Perkins was re-elected in 1895, 1903, 1909, but was not a candidate in 1915.

PERKINS, George Walbridge, American financier: b. Chicago, 31 Jan. 1862. He was educated in the public schools of Chicago; started his business career in the Chicago office of the New York Life Insurance Company in 1877, becoming successively bookkeeper, cashier, inspector of agencies, superintendent of Western department, third vice-president 1892; in charge of agency force with headquarters in home office and second vice-president in 1898. In 1900 he became chairman of the finance committee of the New York Life and in 1903 was made vice-president. From 1901 to 1910 he was a partner in the banking firm of J. P. Morgan and Company. He is a director of the International Harvester Company and president of the New York Palisades Interstate Park Commission, and director in several industrial corporations. In 1912 Perkins supported Roosevelt and the Progressive party and in 1915 opposed the return of the Progressives to the Republican fold.

PERKINS, Jacob, American inventor: b. Newburyport, Mass., 9 July 1766; d. London, England, 30 July 1849. He was early apprenticed to a goldsmith and at 15 invented a method of plating shoe-buckles, which he manufactured successfully. At 21 he was engaged in making dies for the copper coinage of Massachusetts, shortly after inventing a machine which cut and headed nails at one operation. He gained no pecuniary advantage from this invention owing to the mismanagement of his partners, but soon afterward originated the idea of substituting steel for copper plates in banknote engraving, thereby greatly lessening the expense of the operation, and later invented a method of transferring the costly engraving from one plate to another by means of pressure. He removed to Philadelphia where he was associated with a firm of banknote engravers and in 1818 went to London and obtained the contract for supplying the Bank of Ireland with plates. Later he became interested in steam artillery and constructed a gun in which steam was used for the propelling power in place of powder. He also invented an instrument for measuring the depth of water, called the bathometer, and the pelometer for measuring the speed at which a ship is moving. Science also owes to him its knowledge of the fact that water is compressible.

PERKINS, Justin, American Congregational clergyman and missionary: b. West Springfield, Mass., 12 March 1805; d. Chicopee, Mass., 31 Dec. 1869. He was graduated from Amherst in 1829 and later studied at the Andover Theological Seminary. In 1833 he was ordained to the ministry and sailed for Persia where he established a mission among the Nestorians. He translated the Bible into modern Syriac and wrote a commentary on Genesis and Daniel, meanwhile aiding in the establishment of missionary schools and directing general missionary work. He wrote 'A Residence of Eight Years in Persia' (1843); 'Missionary Life in Persia' (1861), etc.

PERKINS, Thomas Handasyd, American merchant: b. Boston, Mass., 15 Dec. 1764; d. Brookline, Mass., 11 Jan. 1854. He entered a counting-house in Boston when very young and later joined his brother in mercantile business in Santo Domingo. He returned to the United States and then went to China and East India in order to attain a thorough knowledge of the trade, finally settling in Boston where he amassed a large fortune. In 1805 he was elected to the legislature of Massachusetts where he served for many years. He was deeply interested in philanthropic enterprises, founded the Perkins Institute for the Blind at Boston, contributed generously to various public institutions, among them the Massachusetts General Hospital and the Boston Athenæum. He was a projector of the Quincy Railroad, the first railroad built in the United States.

PERKINS, William Oscar, American composer: b. Stockbridge, Vt., 23 May 1831; d. Boston, Mass., 13 Jan. 1902. He engaged in teaching in Boston, became known as a musical conductor and organized the Mendelssohn Vocal Quartet, believed to be the first male quartet for concert singing organized in the United States. In 1858 he was conductor of the Boston Music Hall, conducted different musical festivals and was a member of the governing board of the Handel and Haydn Society. He lectured and wrote on musical subjects, composed many songs and hymns, and compiled and edited 60 volumes of vocal music. His last composition was 'The War in South Africa, or Boer and Briton' (1900).

PERKS, Sir Robert William, English engineer: b. Kensington, 24 April 1849. He was educated at New Kingwood School, Bath, and at King's College, London. In 1878–92 he was a railway lawyer; was associated with the late T. A. Walker in building the Barry Docks, Preston Docks, the Manchester Ship Canal, the Inner Circle Railway and other works. He also built the Rio de Janeiro quays and harbor works for the Brazilian government, the port extension at Buenos Aires for the Argentine government and the Transandine Railway between Chile and Argentina. He retired from the firm of Walker and Company in 1912 and is now member of the firm of McArthur, Perks and Company, Ltd., of Ottawa and New York. He is interested in the Georgian Bay Canal and sat in Parliament in 1892–1910 as Liberal member for the South division of Lincolnshire. In 1908 he was made a baronet.

PERLES, pĕr'lĕs, **Joseph,** Jewish rabbi: b. Baja, South Hungary, 1835; d. 1894. He was educated at Breslau and in 1859 received the degree of doctor there. His doctor's thesis was entitled 'Meletemata Peschitthoniana' and propounded a new theory in regard to the origin of the Peshitto version. Dr. Perles was appointed rabbi at Posen in 1862 and removed to Munich in 1871. His later writings dealt mainly with Hebrew philology and the history of the Jews in the Middle Ages.

PERLEY, Sir George Halsey, Canadian statesman: b. Lebanon, N. H., 12 Sept. 1857. He was educated at Ottawa Grammar School and at Harvard University; entered commercial life in Canada and soon had acquired extensive lumber manufacturing, railroad and banking interests. He was elected to the Dominion House of Commons in 1904; was chief Conservative whip in 1911 and a violent opponent of reciprocity with the United States. When the Borden Cabinet was formed he became minister without portfolio. In 1913 Perley became High Commissioner for Canada in London. He was knighted in 1915.

PERLEY, Moses Henry, Canadian scientist: b. Maugerville, New Brunswick, 1804; d. 1862. He received his education at Saint John and in 1830 became a member of the bar but did not practise. He acquired large lumbering and manufacturing interests and becoming interested in exploration soon became an expert on the physical resources of the Canadian provinces. In 1840 Mr. Perley was made Indian commissioner and emigration agent for the province of New Brunswick. During the years 1848–51 Perley made exhaustive reports on the fisheries of Canadian eastern waters and in 1854–66 prepared much of the data for the Canadian side in the discussion of a reciprocity treaty with the United States. The Natural History Society of New Brunswick was founded by Mr. Perley who was also a frequent contributor to literary and scientific journals. He published 'Report on the Forest Trees of New Brunswick' (1847); 'Catalogue of Fishes of New Brunswick and Nova Scotia' (1851); 'Observations on the Geology and Physical Characteristics of Newfoundland' (1862).

PERM, pĕrm, Russia, (1) the capital of an eastern government, on the high left bank of the Kama, at the confluence of the Chusovaya, about 250 miles due north of Ufa, with which it is connected by rail via Ekaterinburg and Cheliabinsk. It was founded in 1781, has straight and spacious streets, a well-kept park and a number of handsome public buildings, among them the cathedral and 18 other churches. There are also a gymnasium, a theological seminary, several other educational and scientific institutions and a civil and military hospital. A permanent exhibit of the city's products is maintained in the Zemstvo building. The chief employment is in connection with the iron smelting and refining works. There is a considerable trade with the inland districts, and an increasing river traffic. The great highway connecting Moscow with Siberia passes by way of Perm. Pop. 105,410. (2) A government of eastern Russia, politically attached to European Russia, but topographically Asiatic and almost enclosed by the Ural Mountains. Area, 127,500 square miles. While lumbering, agriculture and stock raising are considerable industries, Perm's commercial importance is due to its vast mineral wealth, consisting of iron, coal, salt, zinc, copper, nickel, platinum, silver and gold. Pop. 4,083,200. See RUSSIA.

PERMANENT WAY, a term used in Great Britain to designate the finished roadbed and track of a railway, including bridges, viaducts, crossings and switches. The term is used in contradistinction to a temporary way, such, as is made in construction, for removing the soil and making fillings.

PERMANENT WHITE, a white pigment consisting of sulphate of barium precipitated from the chloride by adding dilute sulphuric acid. It is used as an adulterant of, and as a substitute for, white-lead.

PERMANGANATE. See MANGANESE.

PERMIAN, *in geology,* the name given to the last of the smallest time divisions of the Palæozoic, which are of worldwide recognition. The rocks of this age were first studied by Murchison, Dr. Verneuil and Keyserling, in the Russian province of Perm, whence the name. In Germany they are also known by the term "Dyas," proposed by Geinitz on account of their well-marked division into two groups — the Rothliegende and Zeckstein. In Europe these rocks overlie the Carbonic for the most part unconformably, but in North America there is no sharp line of demarkation between them. This has led to a difference in grouping of the time division in question, and the formations belonging to it. English and Continental geologists consider the Permian a distinct division, equivalent to Siluric, Devonic or Carbonic (Carboniferous), while in America it was formerly made the terminal subdivision of the Carbonic era. The present textbooks, however, conform generally to the European mode of classification. Its best development in this country is in the Middle West. According to the latest studies of Puner, the Permian of Kansas consists of a lower marine series —«Big Blue series,» and an upper non-marine series, «Cimarron series.» In Pennsylvania, Ohio and West Virginia the deposits of this age are known as the Upper Barren Measures or Dunkard Creek series. They are non-marine beds of sandstones, shales and calcareous layers, with some thin seams of coal. The greatest thickness is not much over 1,000 feet. Palæontologically the Permian deposits are especially interesting from the presence of amphibians and of primitive reptiles. See CARBONIFEROUS.

PERMUTATIONS. See COMBINATIONS.

PERNAMBUCO, pĕr-năm-boo'kō (Port. pĕr-nän-boo'koo), a maritime state of Brazil and its capital city. (1) The state of Pernambuco is bounded on the north by the states of Parahyba, Rio Grande do Norte and Ceará, on the east by the Atlantic, on the south by Alagôas and Bahia and on the west by Piauhy; lies between 7° and 10° 40′ S. and between 34° 45′ and 42° 10′ W.; has an area of 49,573 square miles, with a coast line of about 140 miles. Next the sea there is a low coastal plain reaching 30 or 40 miles inland, and back of that the Matta or fertile forest belt and farther inland the treeless plateaus and mountains. The Sierra dois Irmaos on the western frontier is the watershed of the Paranhyba and São Francisco, and into the latter river the inland waters of Pernambuco flow. The São Francisco (q.v.) is navigable for nearly its whole extent. The climate varies greatly in the two diverse zones, being moist in the Matta, which follows the sea coast, whereas the Sertão, or «desert» up-country, is dry, arid and almost uninhabited. The alluvial plain grows sugar-cane, cotton, tobacco, vanilla, cacao, coffee, redwood, cocoanuts and, among many important drugs, ipecacuanha. There is a little gold and a great deal of excellent marble. Little development of the mineral wealth of Pernambuco has been attempted, but it is known that coal, iron, manganese, Chile nitrate and a superior grade of kaolin have been found in paying quantities. Cattle raising flourishes in the interior, and dairying is increasingly important. Rum and hides rank next to cotton and sugar as the most valuable staples. Pernambuco is the chief sugar and cotton state of Brazil. Its annual yield of cotton is valued at $5,000,000, and its 60 sugar mills turn out 180,000 tons of sugar per year. Along with the latter industry is the distillation of rum as a by-product. Recife or Pernambuco (see below) is the most important port; there are good harbors at Tamandaré, Porto de Gallinhas and Porto do Rio Formosa. The principal cities are Victoria (30,000); Goyana (28,000); Garanhuns (25,000); Cabo (25,000); Escada (22,000); Limoeiro (20,000); and Rio Formoso (20,000). They are all connected with the capital by rail. There are 560 miles of railroad in the state. Its annual exports amount to nearly $15,500,000; the imports to about $13,700,000. Pop. (1912) 1,650,000. The region was first settled at Iguarassu and Olinda by the Portuguese in 1534. The Dutch held it 1630–54, and founded Moritzstadt, now the capital. The island of Fernando de Noronha, in lat. 30° 50′ S. and 34° 47′ west of Rio de Janeiro, belongs to Pernambuco, and so does the island of Itamaraca lying along the coast 18 miles from the city of Recife. (2) The city of Pernambuco, called by the Brazilians Ciudade do Recife, that is, Reef City, the third city of the republic, excelled in population and wealth only by Rio de Janeiro and Bahia. It is an Atlantic port, distant, 3,982 marine miles from New York and 4,065 from Liverpool. The city is cut into three parts by the Rio Capiberibe and the Rio Beberibe, Recife occupying the northeast part parallel to the coast reef, and São Antonio being an island southwest of it and southeast of the mainland, on which is the third section, Bōa Vista. Two bridges join Recife and São Antonio, and three connect São Antonio and Bōa Vista. Recife is the old city, is poorly built and contains the great business houses. São Antonio has the theatres, government buildings, customs house and Parliament; is well built; and has many traces of Dutch occupation. Bōa Vista is largely residential with tropical one-story houses and beautiful gardens; it contains the archi-episcopal palace. The harbor is protected from the sea by a long reef, and to this has been added at a cost of $28,000,000 a breakwater and a stone jetty; with docks affording 28 feet to 33 feet of water, and equipped with electric cranes and capacious storage houses, and plans are on foot to improve the port by excavation. The city is now a regular port for 10 steamship lines, and some 900 steamers aggregating 1,700,000 tons enter and clear annually. The annual imports amount to about $15,000,000 and the exports to $5,000,000. The imports are mainly foodstuffs — codfish, flour and dried beef — and manufactures of cotton and of iron and steel. The principal exports are sugar, cotton, carnauba wax and goat skins. Four railroads connect the city with various parts of the state. There are cotton factories, oil mills, machine shops, ship-yards, cigar manufactories, sugar refineries and manufactures of glassware and shoes. Pop. 268,000.

PERNAMBUCO WOOD. See BRAZIL WOOD.

PERNICIOUS ANÆMIA (also called PROGRESSIVE PERNICIOUS ANÆMIA, MALIGNANT ANÆMIA, IDIOPATHIC ANÆMIA, ESSENTAL ANÆMIA, etc.), a severe blood-disease, a progressive and usually fatal form of anæmia. It was first described in 1855, by Addison, as an idiopathic or self-originated anæmia, hence the term idiopathic or Addison's anæmia. In 1868 it was more closely studied by Biermer, especially as to the post-mortem appearances; and when these are distinctive the disease is sometimes spoken of as Biermer's anæmia. The disease is characterized by a great destruction of the red corpuscles of the blood and lesions of the blood-making organs. The red corpuscles are mixed with megalocytes microcytes and poikilocytes. There is no increase of leucocytes. Post-mortem examination shows that the skin is pale lemon-colored; fat is yellowish pale; there is little loss of subcutaneous fat, but fatty degeneration of organs is common;

heart-muscles are light-colored, flabby and fatty; other muscles may be red; the cavities of the heart contain a little light-colored blood. There is fatty degeneration in the liver, kidneys, gastric and intestinal walls; extravasation of blood in the retinæ, serous and mucous membranes and skin; swelling and redness of lymphatic glands; and commonly sclerosis of the posterior and to some extent of the lateral columns of the spinal cord. Deposits of iron, probably due to the great destruction of the red corpuscles, are found in the liver, spleen, pancreas, kidneys, etc. The bone-marrow is frequently very red.

The etiology is obscure. There is undoubtedly hæmolysis or disintegration and degeneration of the blood. This may be caused by long-continued loss of blood, by splenic, miasmatic, glandular, strumous or malignant disease, by intestinal parasites, etc. Bad hygienic conditions, especially impure air and poor and insufficient food, are predisposing causes. The disease most often appears in middle life, and is sometimes almost endemic. The symptoms, which develop slowly, are pallor, shortness of breath, palpitation, muscular weakness. œdema about the ankles. colorless lips and gums, gastro-intestinal disturbance — diarrhœa, dyspepsia, nausea and vomiting or constipation, with loss of appetite — aneurosis, dark urine of low specific gravity, slight fever, though at night the temperature may be 102° F., rapid pulse (100 to 120), soft or full, and sometimes ecchymoses. Death usually occurs in from two months to a year. The treatment is only palliative — rest in bed, nourishing and easily digested food, gentle massage, etc. Transfusion of milk and blood seems to be of little avail. See BLOOD, DISEASES OF THE.

PEROFSKITE. A mineral consisting of calcium titanite ($CaTiO_3$). Occurs in ore in Gunnison County, Colo.

PEROSI, pā-rō'zē, **Don Lorenzo,** Italian composer: b. Tortona, Piedmont, Italy, 20 Dec. 1872. He was educated at the Milan Conservatory, studied for the priesthood and was ordained at 23. His compositions are exclusively confined to religious subjects in a style appealing peculiarly to the Italian people, crowding the churches with devout listeners. They have thus gained for him much fame throughout Italy, though they are less acceptable to English and German critics on the score of artistic form. He was appointed honorary maestro of the Papal Choir in 1898. He has composed many masses and among his other compositions are the oratorios, 'La passione de Cristo' (1897); 'La risurrezione di Lazora' (1898); 'Il natale del Redentore' (1899), etc.

PEROWNE, pĕ-rown', **John James Stewart,** English Anglican prelate, the son of a missionary: b. Burdwan, Bengal, 13 March 1823; d. 6 Nov. 1904. He was educated at Norwich Grammar School and Corpus Christi College, Cambridge, ordained in 1847 and appointed curate at Tunsted the same year. He was assistant master in King Edward's School, Birmingham, in 1849, for a time a lecturer in divinity at King's College, London, and from 1862 to 1872 vice-principal of Saint David's College, Lampeter. As an authority on Old Hebrew he was one of the Old Testament Revision Committee (1870–84), and in 1875–78 was Hulsean professor of divinity at Cambridge. From 1878 till 1891 he was dean of Peterborough and in the last-named year was consecrated bishop of Worcester. He resigned his see in 1901 and was succeeded by Charles Gore (q.v.). His published works include 'The Book of Psalms,' a new translation, with commentary (1864); 'Immortality,' Hulsean lectures (1868); 'Sermons' (1873); 'Life and Remains of Bishop Thirlwall' (1878); 'The Church, the Ministry, and the Sacraments'; and an Arabic grammar. He edited the 'Cambridge Bible for Schools' and the 'Cambridge Greek Testament' for schools.

PEROXIDES, binary compounds of oxygen containing the greatest amount of that element; thus of the two oxides of hydrogen, H_2O and H_2O_2, the latter is the peroxide; of the two oxides of sulphur, SO_2 and SO_3, SO_3 is the peroxide; and so on. Some of the metallic peroxides, such as those of barium and lead, appear to be salts of hydrogen peroxide. See HYDROGEN.

PERPENDICULAR, *in geometry,* a line falling directly on another line so as to make equal angles on each side; called also a *normal line.* Two perpendicular lines form a right angle with one another. As the angle of two intersecting curves is defined to be that of the tangents at the point of intersection, it is possible to define perpendicularity or normality between curves. A plane is perpendicular to another plane if a line drawn on one of them, perpendicular to the line of intersection, is at right angles to a line on the other plane perpendicular to the line of intersection. A line is perpendicular to a plane if it is perpendicular to two distinct lines in the plane through its foot. Two non-intersecting lines may be said to be perpendicular if one lies in a plane perpendicular to the other.

PERPENDICULAR STYLE, a variety of pointed or Gothic architecture, the latest to be introduced. It was first noticed in Gloucester in 1337 but did not acquire distinction until 1370. From that time on it prevailed in England until the middle of the 16th century, the period during which the Flamboyant Style prevailed in France, and is to be regarded as a reaction from the too profuse exuberance of flowing curves in the French practice. It is characterized chiefly by the predominance of upright straight lines in its tracery. The mullions of the windows are vertical, rising generally to the main arches, and are often crossed by horizontal bars or transoms. The mechanical simplicity of this kind of tracery enabled the architects of the period to increase the size of the windows without difficulty or danger, and large windows are accordingly another distinctive feature of this style. The roof of such buildings is often their most striking feature, being either vaulted or supported by open timber work. Another characteristic of the perpendicular style is its extensive use of paneling, suggested obviously by the intersections of the vertical and horizontal construction lines. Nearly all the colleges of Oxford and Cambridge are in this style, and it is also exemplified more or less in many of the English cathedrals, notably York and Canterbury, and in several of the principal churches. The example usually cited as perhaps the most exquisite is

Saint Michael's Church at Wrexham, in Coventry.

PERPETUAL MOTION, literally, a device or mechanism capable of maintaining its own state of internal motion forever, without depending upon a supply of energy from external sources. In this sense, the heavenly bodies constitute a system which approximates very closely to perpetual motion, since their movements would probably continue forever if it were not for the dissipation of energy due to their slight tidal influences upon one another, and to the possible existence of some unrecognized resisting medium in space. The phrase «perpetual motion» is not commonly used in this sense, however; for a «perpetual motion» is technically and almost universally understood to be a device or apparatus which is capable of performing an indefinite quantity of mechanical work, without absorbing an equivalent quantity of energy from external sources. (See ENERGY; MECHANICS). The search for a device of this sort was begun many centuries ago, and although educated physicists have now pronounced perpetual motion (in the more limited technical sense) to be impossible, there are still many persons who are hopefully engaged in the search for it. When the fundamental principles of mechanics were unknown, and it was believed (for example) that heavy bodies, even in a vacuum, fall faster than light ones, there was nothing unreasonable in the hope that a machine might be devised which should furnish energy enough, not only to keep itself going forever, but also to run other machines, and thus do useful work. Further study of the behavior of bodies and forces led to the discovery of certain laws of motion which clearly indicated the impossibility of solving the problem of perpetual motion by any combination of cranks and levers and gears, or by any arrangement of water wheels and pumps, or other simple mechanical devices. It is true that these laws of motion are based upon experimental evidence, and hence their truth may be legitimately questioned; but it must be remembered that all of the great advances in applied mechanics have been based upon the assumption that they rigorously exact, and it is suggestive to note that whenever a machine is constructed so that it demonstrably violates one of these laws, it does not work. Many of those who still persevere in the search for perpetual motion are ignorant of the laws of mechanics, or fail to appreciate the vastness of the experimental evidence upon which they are based. Others take refuge in the more recondite forces of nature. Driven from the field of simple mechanics, they seek, in the less explored fields of physics and chemistry, for principles that may conceivably accomplish what they perceive it is hopeless to search for in better explored regions. Electrical and magnetic devices, in particular, have been exploited in great numbers, and a favorite object of search is some sort of a shield which will be impermeable to magnetism. As time has gone on, and the investigation has been prosecuted in every imaginable field, it has become increasingly evident that the problem of perpetual motion has no solution. It will still appeal to many minds as a logical possibility; but thoughtful men, who are educated in physics and mechanics, have come to the conclusion, almost without exception, that there is something about perpetual motion which is incompatible with the general principles that underlie the universe as it is actually constituted. It is certainly safe to say that perpetual motion can never be attained by the hap-hazard methods that its seekers have usually adopted. If attained at all, it must be by mastering all the known principles of physics and mechanics that now indicate its impossibility, and then analyzing these and discovering some flaw in the vast mass of experimental evidence upon which they are based. (See ENERGY.) Consult De Morgan, A., 'A Budget of Paradoxes' (London 1872); Dircks, 'Perpetuum Mobile'; Balfour Stewart, 'The Conservation of Energy' (New York 1874).

PERPETUAL MOTION. See ENDLESS SCREW.

PERPETUITY, «Any limitation tending to take property out of commerce for a longer period than a life or lives in being, and 21 years beyond, and in case of a posthumous child, a few months more, allowing for the term of gestation» (Randall on Perpetuities, p. 48). A perpetuity need not be strictly for an unending period. Perpetuities in both real and personal estates are forbidden by the common law of England, and accumulations are restricted to a period still more brief than a life and 21 years. In most of the United States this prohibition of perpetuties is enforced unchanged or with slight modifications by the constitution of the State or by statute. New York and some other States have limited the permissible number of the «lives in being» in the definition of a perpetuity to two, and have eliminated the extra period of 21 years. See ENTAIL.

PERPIGNAN, pĕr-pēn-yŏṅ, France, capital city of the department of Pyrénées Orientales, on the right bank of the Têt, seven miles from where that river empties into the Mediterranean. It was united to France in 1659. It is a fortified city of the first class, with walls dating back to the days of Charles V. The city itself is supposed to have been founded as early as the 10th century; a charter was granted it by Peter II of Aragon in 1197; and in 1408 the Council of Perpignan met here at the summons of the Antipope Benedict XIII and attempted to bring the great schism to an end. The university founded in 1349 by Peter IV of Aragon, the cathedral of Saint John, begun in 1324, and Le Castillet, a château in the Moorish style, built in 1319 and now a military prison, are among the interesting public edifices. The present city is a garrison town, and manufactures woolens, silks, playing cards, cigarette paper, chocolate, leather goods and corks, besides trading in wines, olive oil, honey and many Mediterranean products. Pop. about 33,000, and with the rest of the arrondissement of Perpignan about 40,000.

PERRAULT, pār'rō, **Charles**, French poet: b. Paris, 12 Jan. 1628; d. there, 16 May 1703. He was a man of erudition, but of little taste, whose verses have not outlived his day. Colbert availed himself of his assistance and made him comptroller-general of the king's buildings. Colbert's influence also procured him an election to the Academy. His mediocre poem, ‘Le Siècle de Louis le Grand,’ which he read before the Academy in 1687, gave rise to the famous controversy on the comparative merits of the ancients and moderns. In his ‘Parallèle des Anciens et Modernes’ (1688–91), in the form of a dialogue, he maintains that the moderns have carried art and science, which were in a state of infancy among the ancients, to the highest perfection, and have excelled them in their works. This opinion was answered by Boileau in the ‘Reflections on Longinus.’ Perrault was also author of ‘Les hommes illustres qui ont paru en France pendant ce siècle’ (1696–1701). His ‘Contes de ma Mere l'Oye’ (1897) (‘Tales of Mother Goose’) have procured for him the title of “inventor of the French Fairy Tales,” and have secured for him a more enduring reputation than any of his other works. See FAIRY TALES.

PERRAULT, Claude, French architect: b. Paris, 1613; d. 1688. At first a doctor of medicine he soon abandoned this field and took up architecture in which he soon became prominent. His chief works are the eastern façade of the Louvre quadrangle, also the southern, the Paris Observatory, and a triumphal arch at the gate of Saint-Antoine; the last-named work was demolished in 1716. Perrault's works include ‘Dix livres d'architecture de Vitruve, corrigés et traduits norwellement en Français’ (1673); ‘Ordonnance des cinq espèces de colonnes selon la méthode des anciens’ (1683; translated into English by John James as ‘A Treatise of the Five Orders of Columns in Architecture,’ 1708).

PERRET, păr'rā, **Frank Alvord,** American volcanologist: b. Hartford, Conn., 2 Aug. 1867. He was educated at the Brooklyn Polytechnic Institute and began as assistant in Edison's East Side Laboratory in 1886. He invented the Perret electric motor and assisted in organizing the Elektron Manufacturing Company of Brooklyn; subsequently was engaged in the manufacture of Perret electric motors at Springfield, Mass. He took up volcanology in 1904 and became honorary assistant to Professor Mattencci in the Royal Observatory, Mount Vesuvius, Italy. He investigated by direct research the Mount Vesuvius eruption of 1906, Stromboli in 1907, 1912 and 1915, Messina 1908, Teneriffe 1909, Sakurashina 1914 and Ætna in 1910. Mr. Perret was director of the Hawaiian expedition of the Massachusetts Institute of Technology and lived at the crater of Kilanea through the summer of 1911. He is the author of scientific papers in professional journals.

PERRIER, păr'ryā', **(Jean Octave) Edmond,** French zoologist: b. near Tulle, Corrèze, 1844. He was appointed professor at the Lycée d'Agen in 1867 and in 1872 became master of conferences at the Ecole Normale de Paris. Four years later he was appointed to the chair of zoology in the museum of Natural History, of which he was afterward director. Perrier became a member of the Académie of Sciences in 1892. His works include ‘Les colonies animales et la formation des organismes’ (1881; 2d ed., 1898); ‘Les principaux types des êtres vivants, etc.’ (1882); ‘La philosophie zoölogique avant Darwin’ (1884); ‘Eléments de zoölogie’ (1886; 8th ed., 1899); ‘Traité de zoölogie’ (1892–1903); ‘La vie des animaux illustrée’ (1903–06); ‘La femme dans la nature et l'évolution du sexe feminin’ (1908).

PERRIN, păr'răṅ, **Bernadotte,** American educator: b. Goshen, Conn., 15 Sept. 1847. He was graduated from Yale in 1869, studied in the universities of Leipzig, Tübingen and Berlin and in 1881–93 was professor of Greek in Western Reserve University, since when he has occupied that chair at Yale. He has written extensively on Greek and Roman history and has edited many textbooks, among them are ‘Cæsar's Civil War’ (1882); ‘School Odyssey,’ 8 vols. and vocab. (1897); ‘Plutarch's Greek Lives’ (1901); etc. He is associate editor of the ‘Twentieth Century Series of Text-Books.’

PERRIN, Ernest L., French-Canadian clergyman and educator: b. province of Quebec, about 1876. He was educated at the College de Montreal, the Seminaire de Philosophic and the Grand Seminaire of Montreal and in 1899 was ordained to the priesthood. Subsequently he entered the Order of Saint Sulpice and made postgraduate studies at Issy, near Paris and at Rome. In 1902–06 he was professor of philosophy at the Seminaire de Philosophie, Montreal, and subsequently became professor of church history at the Grand Seminaire, Montreal. His success as professor led to Dr. Perrin's promotion to the rectorship of the Collegio Canadese, Rome, an administrative post of great responsibility and difficulty. His administration was most successful despite the difficulties brought about by the participation of Italy in the Great War. In 1917, Dr. Perrin returned to Canada and was appointed to a chair in the Grand Seminaire, the theological department of Laval University at Montreal. He has been highly successful as a professor and his individual efforts have been largely responsible for a general improvement of the standards of education of the Roman Catholic clergy in Canada and the United States.

PERRONE, păr-rō'nā, **Giovanni,** Italian theologian: b. Chieri, Piedmont, 1794; d. 26 Aug. 1876. He was educated in the University of Turin, where he received the degree of doctor of theology about 1814. In the following year he entered the Society of Jesus and in 1816 was appointed professor of theology at Orvieto, removing in a similar capacity to the Collegium Romanum in 1823. For a short time he was rector of the Jesuit College at Ferrara. During the troubled years of 1848, he took refuge in England but returned to his old college in Rome in 1850 and became its rector in 1853. Perrone was one of the greatest theologians of his time and took a prominent part in the discussions relative to the dogma of the Immaculate Conception and that of Papal Infallibility. He wrote ‘Prælectiones Theologicæ’ (9 vols., 1835–42; compendium in 2 vols., 47 editions); ‘Il protestantismo e la regola di fede’ (1853); ‘De Domini Nostri Jesu Christi Divinitate’ (1870); ‘De Romani Pontificis Infallibilitate’ (1874).

PERRONET, Vincent, English clergyman: b. London, 1693; d. 1785. He received his education at Christ College, Oxford, entered holy orders and was named curate of Sundridge, Kent. After nine years there he became vicar of Shoreham, where he remained for over 50 years. His interest in the Methodist movement was so active that he was called «the archbishop of Methodism» by Charles Wesley. He was the author of two works in defense of John Locke and of several in defense of Methodism.

PERROT, pār'rō, **Georges**, French archæologist: b. Villeneuve-Saint-Georges, Seine-et-Oise, 1832; d. 1914. He received his education at the Ecole Normale, Paris, and at the French school at Athens. He was member of an archæological expedition to Asia Minor in 1861 and was appointed to the chair of archæology at the Sorbonne in 1875. Perrot was made director of the Ecole Normale Supérieure in 1889 and subsequently became permanent secretary of the Academy of Inscriptions. He reconstructed the text of the Monumentum Ancyranum and published ‘Exploration archéologique de la Galatie et de la Bithynie’ (1862–72); ‘Histoire de l'art dans l'antiquité,’ with Chipiez (1882–); ‘Essai sur le droit public et privé de la république athénienne’ (1867); ‘Les peintures du Palatin’ (1872); ‘Mémoires d'archéologie, d'épigraphie et d'histoire’ (1875); ‘Lettres de Grèce’ (1908).

PERRY, Arthur Latham, American political economist: b. Lyme, N. H., 27 Feb. 1830; d. Williamstown, Mass., 9 July 1905. He was graduated from Williams College in 1852 and became professor of history and political economy there in 1853, which position he held till 1891, when he was made professor emeritus. He published ‘The Elements of Political Economy’ (1865), a work which passed through 20 editions; ‘Introduction to Political Economy’ (1877); ‘Principles of Political Economy’ (1891); ‘Williamstown and Williams College’ (1900).

PERRY, Bliss, American educator and editor: b. Williamstown, Mass., 25 Nov. 1860. He is a son of Arthur L. Perry (q.v.); was graduated from Williams College in 1881 and then studied at the universities of Berlin and Strassburg; received the degrees of L.H.D. from Princeton and Williams, of Litt. D. from Bowdoin and of LL. D. from Lake Forest. He was professor of English at Williams (1886–93); of oratory and æsthetic criticism at Princeton University (1893–99); and of English literature at Harvard, from which post he was called to the editorship of the *Atlantic Monthly*. He is a member of the National Institute of Arts and Letters; was the Harvard lecturer at the University of Paris 1909–10. He has edited many selections from literature and a series of ‘Little Masterpieces.’ Among his books are ‘The Broughton House’ (1890); ‘Salem Kittredge and Other Stories’ (1894); ‘The Plated City’ (1895); ‘The Powers at Play’ (1899); ‘A Study of Prose Fiction’ (1902); ‘The Amateur Spirit’ (1904); ‘Walt Whitman’ (1906); ‘Whittier’ (1907); ‘Park Street Papers’ (1909). ‘The American Mind’ (1912); ‘Carlyle’ (1915).

PERRY, Edward Delavan, university professor: b. Troy, N. Y., 20 Dec. 1854. He graduated from Columbia in 1875; received the degree of Ph.D. from University of Tübingen in 1879 and of LL.D. from Columbia in 1904. He has been connected with Columbia since 1880 as instructor in Greek and Sanskrit (until 1891); professor of Sanskrit (1891–95); professor of Greek (since 1895); dean of faculty of philosophy (1902–09). Prominent in management of American School of Classical Studies in Athens since 1897.

PERRY, John, British physicist: b. Ulster, Ireland, 14 Feb. 1850. He was educated at Queen's College, Belfast, was assistant master at Clifton College 1870–74; professor of engineering in Japan (1875–79) and in London Technical College, Finsbury (1881–96). He is now (1909) professor of mechanics and mathematics at the Royal College of Science, South Kensington. He has published ‘The Steam Engine’ (1874); ‘Practical Mechanics’ (1883); ‘Spinning Tops’ (1890); ‘Cantor Lectures, Hydraulics’ (1882); ‘Calculus’ (1897); ‘England's Neglect of Science’ (1901), etc.

PERRY, Matthew Calbraith, American naval officer: b. Newport, R. I., 10 April 1794; d. New York city, 4 March 1858. He was a brother of Oliver Hazard Perry (q.v.). He entered the navy in 1809, served in the War of 1812 and in 1813 was promoted to the rank of lieutenant. In 1819 he was executive officer of the *Cyane*, which convoyed the first colonists to Liberia, and in 1821 and 1822 was active in protecting commerce from the West Indian pirates. He was then with the Mediterranean squadron for a time; in 1826 was promoted to the rank of commander and in 1832 was again on duty in the Mediterranean in command of the *Concord*. He was next stationed at the Brooklyn Navy Yard (1833–43), and took an important part in the organization of the steam naval service. The *Fulton*, the first steam vessel of the navy, was built under his direction; and when in 1837 he was promoted to the rank of captain, he handled her with such skill that he fully proved the utility of steam vessels for naval purposes. In 1838 he was sent on special duty to England and France to investigate the steam vessels of their navies. In 1841 he was promoted commodore and later assigned to command the squadron on the African Coast for suppressing the slave trade. In 1846 he was appointed second in command of the squadron in the Gulf of Mexico, and in 1847 succeeded Commodore Conner in command. In 1852 he was entrusted by President Fillmore with a letter to the ruler of Japan for the purpose of establishing diplomatic and trade relations, and was given command of a squadron which reached Japan in July 1853. He delivered President Fillmore's letter at Kurihama and returning to Japan early in 1854 concluded, at Yokohama, the treaty which inaugurated a new era in the history of Japan. He gave the Japanese an industrial exposition of American products and manufactures, including an illustration of the railway and telegraph at work. On 14 July 1901, saluted by the guns of three American war vessels under Commodore Frederick Rodgers, grandson of Perry, and of a fleet of Japanese vessels, graded from gunboat to battleship, a superb monolith of Sendai granite, inscribed in letters of gold, written by the Marquis Ito, and to which the emperor himself had subscribed a thousand yen, was unveiled in Perry Park at Kurihama, where the President's letter had first been delivered. Beside many brief biographies in Japanese, consult ‘Matthew Calbraith Perry, a Typical American Officer,’ by William Elliot Griffis (1887).

PERRY, Oliver Hazard, American naval officer: b. South Kingston, R. I., 23 Aug. 1785; d. Trinidad, 23 Aug. 1819. He entered the navy as a midshipman in 1799, cruised among the West Indies, served in the war against Tripoli and in 1807 was commissioned lieutenant, and in 1809 given command of the schooner *Revenge,* which in 1811 was wrecked on Watch Hill Reef near Stonington, Conn. An official court of inquiry acquitted him of all blame. At the outbreak of the War of 1812 he was in command of a division of gunboats at Newport, R. I., but in February 1813 was transferred, at his own request, to Lake Erie under the command of Commodore Chauncey. He was then ordered to Presque Isle (now Erie) to superintend the construction and equipment of a fleet; and by August had built and manned nine vessels. Taking advantage of the temporary absence of the British squadron which had been watching him, he succeeded in getting his fleet out of port, and brought the British to an engagement on 10 September, which resulted in a complete victory for the Americans. (See Erie, Lake, Battle of). Perry immediately sent to General Harrison the dispatch which has become famous in American history, «We have met the enemy and they are ours.» This battle was most important as giving the Americans the control of Lake Erie and enabling Perry to co-operate with General Harrison and the land forces in the operations which resulted in the English evacuating Detroit and the victory at the Thames River. Perry became in the estimation of the people one of the chief heroes of the war, and high honors were paid him wherever he went. Congress gave him a gold medal in recognition of his services, and he was promoted captain. A controversy later arose between Perry and Elliott, the commander of the *Niagara,* as to the part employed by the latter in the battle. In 1814 he was appointed to command the *Java,* then being equipped at Baltimore; and as the Chesapeake was closely blockaded, he found it impossible to get to sea, but was actively engaged in the defense of Baltimore. After the war he cruised in the *Java* on the United States Coast and in the Mediterranean with Decatur's squadron. He was appointed commodore, and in 1819 given command of a squadron for the West Indies and South America. In July of that year he ascended the Orinoco River to Angostura, and on leaving the river was seized with yellow fever, which caused his death on the day that his ship reached Port Spain, Trinidad. He was buried there, but in 1826 his remains were transferred in the *Lexington* to Newport, R. I. Statues of him have been erected at Newport and at Cleveland, Ohio. Consult the ‘Life’ by Mackenzie, A. S. (Akron, Ohio, 1910), and that by Lyman (New York 1905); Barnes, ‘The Hero of Erie’ (New York 1898); Cooper, ‘Lives of Distinguished Naval Officers’ (New York 1846).

PERRY, Peter, Canadian statesman: b. Lennox County, Ontario, 1793; d. 1851. For many years he pursued successfully the career of a farmer after which he became a merchant. Taking an active interest in politics he was one of the founders of the Reform party in Ontario in 1824, and from 1824 to 1836 sat in the Upper Canada legislature as Liberal member for Lennox and Addington counties. In 1841 he was elected to the Canadian legislative assembly. Perry was an advanced Liberal and was undoubtedly ahead of his time in political thought. As a result he was dissatisfied with the program of the Reform party and organized the Clear Grit, or Advanced Reform party.

PERRY, Ralph Barton, American philosopher: b. Poultney, Vt., 3 July 1876. He took his baccalaureate at Princeton in 1896 and his master's and doctor's degree at Harvard in 1897 and 1899, respectively. After teaching at Williams and Smith colleges he came to Harvard in 1902 as instructor, and in 1913 he became professor there. He is especially known as an exponent of the New Realism. He has edited Williams James' ‘Essays in Radical Empiricism’ (1912), and has published ‘The Approach to Philosophy’ (1905); ‘The Moral Economy’ (1909); ‘Present Philosophical Tendencies’ (1912); ‘The New Realism’ (as co-author, 1912); ‘The Free Man and the Soldier’ (1916).

PERRY, Roland Hinton, American painter and sculptor: b. New York, N. Y., 25 Jan. 1870. He was educated at a private school in New York, entered the École des Beaux Arts in 1890 and studied at the Académie Julien and Académie Delacleuse, Paris, in 1890–94. His principal works are the bas-reliefs of Sibyls and the ‘Fountain of Neptune’ in the Library of Congress (1895); ‘Cain’ (1892) and ‘Death of Sigurd’ (1898), paintings in the Detroit Museum of Art; ‘The Valkyrie,’ painting (1899); ‘The Lion in Love,’ sculpture (1899); spandrels on Dewey Arch, New York (1899, since razed); ‘Statute of Circe’ (1900); the Langdon doors of the Buffalo Historical Society (1901); frieze for the New Amsterdam Theatre, New York (1903); statue of Dr. Benjamin Rush, Washington (1904); figure of ‘Pennsylvania’ atop the capitol at Harrisburg, Pa. (1904); statue of Gen. George S. Greene, Gettysburg (1906); group for New York State monument for Lookout Mountain, Tenn. (1907); lions for Connecticut Avenue Bridge, Washington (1908); New York State memorial at Andersonville, Ga. (1910); equestrian statue of Gen. John B. Castleman, of Louisville, Ky.; statues of General Curtis for Ogdensburg, N. Y., and of General Wadsworth at Gettysburg. Since 1916 Mr. Perry has devoted himself to portrait painting.

PERRY, Thomas Sergeant, American educator and critic: b. Newport, R. I., 23 Jan. 1845. He was graduated at Harvard in 1866; was tutor in German there, 1868–72; and instructor in English, 1877–81; professor of English in Keiogijiku University, Tokio, 1898–1901. He has spent much time abroad, and his writings, which are mainly critical and historical, include ‘Life and Letters of Francis Lieber’ (1882); ‘The Evolution of the Snob’ (1887); ‘English Literature in the 18th Century’ (1883); ‘From Opitz to Lessing’ (1884); ‘History of Greek Literature’ (1890); ‘Life of John Fiske’ (1905).

PERRY, William Stevens, American Protestant Episcopal bishop: b. Providence, R. I., 22 Jan. 1832; d. Dubuque, Iowa, 13 May 1898. He was educated at Harvard College, where he was graduated in 1854; prepared for the ministry at the Virginia Theological Seminary, was ordained deacon in 1857 and priest in 1858. After holding various charges in New England and for a time editing the *Church Monthly*, published in Boston, he became rector of Trinity Church, Geneva, N. Y., in 1869. Here he remained for the next seven years, during the last six months of which time he was also president of Hobart College. He had already acted as professor of history there 1871–73, and had been in 1868 appointed, in succession to Dr. Hawks, historiographer of the Episcopal Church, a position which he held until his death. In three successive general conventions, beginning with the year of this appointment, he was secretary of the House of Clerical and Lay Deputies. In 1876 he entered the upper house by his consecration as bishop of Iowa. In addition to his ordinary episcopal labors, he was in general demand as a preacher, and continued during the rest of his life his historical studies. The fruits of these remain especially in the valuable 'Historical Collections' illustrating the history of the Episcopal Church in various States, and the publication of the journals of the General Convention, with notes and appendices, at first in collaboration with Dr. Hawks and afterward independently. He published also a connected 'History of the American Episcopal Church, 1587 to 1883' (1885) and other works.

PERRY, Iowa, city, of Dallas County, on the Chicago, Milwaukee and Saint Paul and the Minneapolis and Saint Louis railroads, 35 miles northwest of Des Moines. It has extensive agricultural interests and manufactures cement blocks, tile spades, washing machines, etc. It contains a public library and is the seat of Jones College. The city owns the water-supply system. Pop. 4,630.

PERRY, N. Y., village in Wyoming County, on the Buffalo, Rochester and Pittsburgh Railway, 55 miles southwest of Rochester. The village has a public library, a masonic temple and modern school buildings, knitting mills, cutlery factory, machine shops, etc. The water-supply system is the property of the village. Pop. 5,009.

PERRY, Okla., city, county-seat of Noble County; on the Atchison, Topeka and Santa Fé Railroad, about 30 miles northeast of Guthrie. It is in an agricultural region, in which stock-raising is an important industry. The chief manufactures are flour, feed, machine repair-shops and cigars. It has an extensive trade in grain and livestock. Perry was settled in 1889 and a United States landoffice is stationed here. It has a Carnegie library, public parks and operates municipal waterworks and electric-lighting plant. Pop. 3,200.

PERRY, a fermented beverage made from the juice of pears.

PERRYVILLE, Battle of, and the Kentucky Campaign of 1862. After the expulsion of the Confederate army from Corinth, Miss. (q.v.), 29 May 1862, General Halleck's large army of 137,000 men was unfortunately and, as it afterward proved, mistakenly divided, and the army of the Ohio, under Gen. D. C. Buell, 10 June, upon a peremptory demand from the authorities at Washington, was ordered to move on Chattanooga, the movement beginning next day along the line of the Memphis and Charleston railroad. This railroad had to be rebuilt as the army moved forward, and from its location it was constantly under attack and destruction by enemy raiders. The Union arms had opened the Mississippi to Memphis and Vicksburg, and all the country north of the line of the Memphis and Charleston Railroad and Tennessee River, as far east as Bridgeport, Ala., and following the Cumberland Mountains northward, to the Ohio River, had come into Union possession. The two great States, Kentucky and Tennessee, except the eastern part of the latter, and the key to the railroad system of the South were held by Union troops. The advance of the Union armies on Chattanooga and Knoxville, in June and July, led to prompt reinforcement of Chattanooga and Knoxville by the Confederates, and Gen. Braxton Bragg was authorized to make a counter movement into Middle Tennessee and Kentucky. The idea obtained in the South that the people of Kentucky would rise and swell the Confederate ranks, and at Richmond it was thought that Bragg could march through Tennessee and Kentucky to the banks of the Ohio and beyond. Bragg was then at Tupelo, Miss., and Gen. E. Kirby Smith was in command of the department embracing Chattanooga and Knoxville with a force of 15,000 men. Information led both to believe that, if properly armed, at least 25,000 in Kentucky and Tennessee would join their armies. At the same time Generals Earl Van Dorn and Sterling Price were to move from Mississippi into West Tennessee and Bragg thought that all his forces would unite in Ohio. On 21 July he ordered his own army of 45,000 from Tupelo to secure Chattanooga against Buell's advance, and to prepare for movement to the Ohio. Bragg divided his army into two wings, the right commanded by Gen. L. Polk, the left by General Hardee. He crossed the Tennessee at and above Chattanooga on 21–24 August, and his column of 30,000 men took up the march over Walden's Ridge and the Cumberland Mountains. Turning Buell's left, whose advance was at McMinnville and Altamont, it threatened Nashville; whereupon Buell ordered a concentration of his army at Murfreesboro, where they arrived 3–5 September. Hearing there of Nelson's defeat at Richmond, Ky. (q.v.) on 30 August he fell back to cover Nashville and his connections with Louisville. Bragg now turned northward for Louisville and the Ohio. He entered Kentucky 5 September, about 45 miles above Nashville, and halted at Glasgow on the 12th. On the 13th he found that Buell was ahead of him on the railroad from Nashville to Bowling Green. Bragg, however, marching from Glasgow across the country, with a force of 25,000, captured Munfordsville, with over 4,000 men, 17 September, and took up a strong position on the south side of Green River, intending to give Buell battle, but owing to want of supplies he changed his mind. He released his prisoners on parole and on the night of the 19th abandoned his position, which Buell, marching from Bowling Green, was about to attack, and marched for Bardstown, thus leaving the road to Louisville open to Buell, who entered the city on the 25th. Bragg seems to have given up all idea of fighting and devoted all his energies to foraging for supplies and endeavoring to raise recruits for his army. He was eminently successful in the first, gathering huge droves of cattle and trains of provisions, and some recruits joined him. Though he had been at first headed for Ohio, he was now traveling away from it. Meanwhile E. Kirby Smith had occupied Lexington, Paris, Frankfort and Cynthiana, and sent General Heth to threaten Covington and Cincinnati. On 18 September Smith was in motion to join Bragg at Shelbyville, but hearing of Gen. Geo. W. Morgan's evacuation of Cumberland Gap (q.v.) and retreat northward, he suspended his movement westward and marched his entire army east toward Mount Sterling, to intercept Morgan. In this he failed, and as Bragg reports: «The delay caused by the necessity of Smith's going prevented his forming junction with my forces at Shelbyville, and enabled General Buell to reach Louisville before an assault could be made by the combined force.» Smith next marched back to the vicinity of Frankfort, Bragg in person joining him from an inspection tour, with the information that Buell was moving out of Louisville.

On reaching Louisville Buell found thousands of volunteers pouring in from the West, and Grant sent him a detachment, increasing the army of the Ohio to nearly 100,000. The army was ready to march against Bragg at Bardstown, where only Polk's corps remained, when on the 29th Buell was handed an order from Washington relieving him from command and assigning Gen. Geo. H. Thomas to succeed him. Thomas protested against the change of command, and the order was suspended, Thomas being announced in orders as second in command, but the straightening out process cost a delay of 24 hours. The three corps of the army were commanded by Gens. A. McD. McCook, T. L. Crittenden and C. C. Gilbert. On 1 October Buell's army of 68,000 fighting men moved out of Louisville in three columns against Polk at Bardstown. General Sill with his own division and Dumont's marched direct to Frankfort to threaten E. Kirby Smith. Bragg, at Frankfort, believing that Sill was but the advance of Buell's main body marching for that place, ordered General Polk to move the entire army from Bardstown toward Frankfort and to strike Sill and Buell in flank, while E. Kirby Smith, advancing from Frankfort, met the Union column in front. But Polk, finding that he had Buell's whole army before him, disregarded Bragg's order and retired slowly by way of Perryville toward Harrodsburg, where he thought that the entire Confederate army in Kentucky would be concentrated. When Bragg heard of this, 4 October, he, Smith and others were formally inaugurating a secession governor of Kentucky at Frankfort, a ceremony that was cut short upon the announcement that Sill was rapidly approaching. Smith, accompanied by the newly inaugurated governor, retreated in haste toward Lexington. Dumont's division occupied the city, and Sill slipped away on the 8th to join Buell. Smith took position near Versailles, to cover Lexington and watch an advance from Frankfort. Polk, with two divisions, was ordered to join Smith. Hardee, with his two infantry divisions and Wheeler's cavalry, was left to hold Perryville and cover the depot of supplies at Camp Dick Robinson.

Meanwhile Buell's three columns were approaching Perryville. Gilbert, with the centre, preceded by a brigade of cavalry, drove back Wheeler, and on the night of the 7th went into camp four miles from Perryville, about 40 miles south of Frankfort. Crittenden, with the right, was to have encamped at Hayesville, but finding no water, he marched three miles to the west. McCook, with the left, after some resistance, reached Mackville, 10 miles from Perryville, the same distance from Harrodsburg, and six miles in rear and to the left of Gilbert. Late in the afternoon Bragg, at Harrodsburg, heard from Hardee that he was being pressed by Gilbert, whom the Confederates supposed to be isolated from the rest of Buell's army and ordered Polk to join Hardee with Cheatham's division and attack Gilbert. Hardee and Polk urged a union of Bragg's and Smith's armies before giving battle. Early in the morning of the 8th, when it was seen that the Union forces were advancing, Polk, correctly informed that the greater part of Buell's army was in his front, determined to disregard Bragg's order to attack, and after consultation with Hardee and other officers, he concluded «to adopt the defensive-offensive.» The battle began in an effort of the Federals to get water, through gaining possession of the springs at Perryville, in quest of which Col. Dan McCook's brigade advanced at 3 A.M. of the 8th and took position in advance of Chaplin's Creek. After daylight it was joined by the remainder of Sheridan's division, followed by Mitchell's and a brigade of Schoepf's. Sheridan moved up the road, driving back strong skirmish-lines, and nearly a mile in advance, with Mitchell on his right, he formed line of battle on ground overlooking a branch of Doctor's Creek. It was nearly 11 A.M. when Rousseau's division, the advance of McCook's corps, came up on the left of Sheridan, about 400 yards from him. Lytle's and Harris' brigades were put on the right. Terrill's brigade of Jackson's division on the left, Webster's brigade of Jackson's division in rear of Rousseau, and Starkweather's brigade of Rousseau's division, with two batteries on high ground, to the left and rear of Terrill's brigade. Soon infantry and artillery on both sides were engaged. The battle was mainly fought on McCook's line. Buell's army numbered about 58,000 men, and was confronted by 16,000. But this inequality was not suspected by either side. Buell thought the whole of Bragg's command was before him and made careful plans for an attack on the following day. The Confederates believing they faced only a single corps attacked courageously.

General Bragg came upon the field from Harrodsburg about 10 A.M., and was surprised and angered when informed by Polk that he had assumed the defensive-offensive. Cheatham's division of 7,000 arriving, Bragg made some changes in the disposition of the troops, moving Cheatham's division to the right, and ordered Polk to open the attack. Polk was dilatory, and Bragg led the entire line forward, his left striking Sheridan, and the centre and right falling furiously upon McCook at 2 P.M., immediately involving his entire line in a desperate struggle. Terrill's brigade, on the left, but partially formed, received a heavy blow from Cheatham's division and Wharton's cavalry; General Jackson, the division commander, was killed at almost the first fire, while directing the fire of Parson's battery; and the brigade, composed of raw troops, after inflicting severe loss on Maney's brigade, was routed, abandoning seven of Parson's eight guns. The Confederates, advancing, struck Starkweather to the rear and left of Terrill, and were checked and repulsed by the fire of his two batteries and unyielding infantry, the attacking brigades of Maney and Stewart losing nearly half their men. Later in the action Starkweather was obliged to yield some ground, and General Terrill, in a vain effort to rally a part of his brigade on him, was mortally wounded. From the attack upon Terrill the battle rolled down the line upon the brigades of Lytle and Harris, of Rousseau's division, the greater part of Buckner's division attacking them with fury and, taking advantage of an interval of 400 yards between the right of Rousseau and the left of Sheridan, pressing their attack at this point. Colonel Webster sprung to Rousseau's support and was killed; his brigade, with those of Lytle and Harris, were soon overpowered and forced back nearly a mile; Lytle was seriously wounded and taken prisoner; and the three brigades, terribly thinned, were about to dissolve in fragments, when Colonel Gooding's brigade, of Mitchell's division, came up from the right, made a gallant charge, and after nearly an hour's contest, in which it lost 499 killed and wounded, one-third of its strength, checked the Confederate advance and then threw it back beyond Chaplin's Creek. Steedman's brigade arrived about sunset and Lieut. F. G. Smith's battery, supported by the 18th United States Infantry, was pushed forward and opened with canister; but it soon grew dark and the firing ceased on both sides. On McCook's right Sheridan was attacked by a part of Buckner's division and that of Anderson. He had a good position and, beside checking the assault on his own front, helped McCook by turning his artillery upon the flank of the troops opposing him; but unfortunately Gilbert, his corps commander, ordered him and Mitchell to fall back, thus uncovering McCook's right. However, he soon advanced, held his ground, though severely pressed, and as his right was strongly threatened, Mitchell sent General Carlin's brigade to his assistance. Carlin formed on his right and, making an impetuous charge, broke the Confederate lines and drove them back through Perryville, capturing in the town 15 to 20 caissons and wagons, loaded with ammunition. and a guard of 140 officers and men. This was about nightfall and ended the battle on that part of the field. Crittenden's corps, on the right, was not engaged and had but two men wounded. Of Buell's 58,000 men on the field less than half were engaged. The noise of the action had been muffled by the surrounding woods and Buell was unaware of the battle till 4 P.M. The Union loss was 845 killed, 2,851 wounded and 515 missing, an aggregate of 4.211. The Confederate loss was 510 killed, 2,635 wounded and 251 missing, an aggregate of 3,396. Considering the number of men engaged and the brief duration of the battle, it is regarded as the bloodiest engagement of the Civil War.

During the night Bragg, abandoning his dead and many wounded, and 13 of the 15 guns he had captured, withdrew from the field, and at daylight he retreated to Harrodsburg, where he was joined by E. Kirby Smith, raising his command to over 60,000 men. Buell awaited the arrival of Sill's division, which arrived on the 11th, and next day advanced and maneuvered to turn Bragg's left. Bragg fell back to Bryantsville, and on the 13th he began his retreat from Kentucky by way of Cumberland Gap. Buell pursued, the bulk of his army stopping at Crab Orchard, the advance going as far as London, where pursuit ended, and Buell moved back to the line of the Louisville and Nashville Railroad. Bragg continued his retreat, passing through Cumberland Gap 19-26 October.

The Confederate campaign into Kentucky was a failure and a sore disappointment to General Bragg and his government. In his report Bragg says: «The campaign was predicated on a belief and the most positive assurance that the people of this country would rise in mass to assert their independence. No people ever had so favorable an opportunity, but I am distressed to add there is little or no disposition to avail of it. Willing perhaps to accept their independence, they are neither disposed nor willing to risk their lives or their property in its achievement. With ample means to arm 20,000 men and a force with that to fully redeem the State, we have not yet issued half the arms left up by casualties incident to the campaign.» Consult 'Official Records' (Vol. XVI); Fry, 'The Army under Buell'; the Century Company's 'Battles and Leaders of the Civil War' (Vol. III).

E. A. CARMAN.

PERSEPHONE, pėr sĕph'ō-nē (Greek Περσεφὸνη; Lat. *Proserpina;* other Greek forms appear), in Greek myth, according to some the daughter of Zeus and Styx, or, according to the more usual tradition, the daughter of Zeus and Demeter (Ceres). Pluto carried her off, with the consent of Zeus, and made her his wife. This fable has been treated by several poets and adorned in different ways. In Homer, where she bears the name of Persephoneia, no mention is made of her having been carried off by Pluto against her will. She is simply represented as the majestic and awful wife of Pluto and queen of the lower world. According to the later story Persephone was once dancing in the choir of nymphs led by Athena and Artemis in a grassy meadow. Leaving the dancers she went with some of her companions to gather flowers. At the prayer of Pluto, and with the consent of Zeus, the earth produced 100 blooming narcissuses from one root, and gods and men were astonished at their beauty and delighted by their odor. The maid eagerly gathered them, and, beguiled by their magic power, wandered from her companions. Suddenly the earth opened, and Pluto, rising from the chasm with his immortal steeds, seized Persephone, and carried her in a golden chariot to the lower world. She called loudly on her father for protection, but in vain; no one heard her cries except Hecatē and the Sun.

In vain did Zeus attempt to obtain her mother's consent to her marriage with Pluto and he at length granted her permission to return to the upper world provided she had not tasted any of the food of the gods. But while walking through the lovely fields of Elysium she had eaten a pomegranate, and all that Zeus could grant to the prayers of her afflicted mother was that she should spend the spring and summer of each year in the upper world. See DEMETER.

The chief seats of the worship of Persephone were Attica and Sicily, although her worship was not wholly neglected in any part of Greece or in any of the Greek colonies. Sometimes she shared the honors paid to her husband, sometimes those paid to her mother, and sometimes particular celebrations were dedicated to her alone. In Attica she bore the name of Kore, that is, the daughter, namely, of Demeter, who is sometimes called He Meter, the mother; and the Eleusinian mysteries (q.v.) held in September, were sacred to both. The story of Persephone in the simple form in which it is given by the Greek poets is universally held to be a mythical account of the changes of the seasons, and this interpretation is so obvious that the ancients themselves saw in the abduction of Persephone a symbol of autumn when the fruits of nature disappear; and in her return a symbol of spring. This idea of the myth is beautifully worked out in Schiller's ballad, ‹Klage des Ceres.›

PERSEPOLIS, pėr-sĕp'ō-lis, in ancient geography a capital of the Persian empire, near the junction of the Araxes River (now the Kur) and the Medus (now Polvar), and 35 miles northeast of the modern city of Shiraz. Persepolis is Greek for «Persian City»; the form of the Persian name is unknown, but as the earlier notices in Greek authors call it Persæ, and as it succeeded Pasargadæ (q.v.), whose name possibly means «the city of the Persians,» it may be conjectured that the Greek name is a translation of the Persian and not a new appellation. The city, probably already a great one, became the Persian capital under Darius I. Both Darius and Xerxes did much to build up and beautify the city, which was strongly fortified with a triple wall about the citadel, on which were the royal palace and treasury. This part of the city was destroyed by Alexander the Great (about 330 B.C.); but the northern part, the real city, was unharmed and retained some importance down to the 1st century B.C. About 200 A.D. Istakhr arose here and became a royal city of the Sassanids down to 632 A.D. The ruins of Persepolis are among the most important of the remains of ancient Persia. They lie in the desert plain of Merdasht nearly hemmed in by mountains, which are sufficiently described in the native name of Seh Gumbeddan, that is, «the three cupolas»; the natives call the ruins Takhti Jemshed («Jemshed's Throne»), Tchil Minar («Forty Pillars»), and Nakshi Rustem («Rustem's Picture»). The first two names are variants and are applied to the buildings topping three terraces, up which lead a double staircase, broad enough for 10 men to pass abreast, with a slope so gentle that it is easy to ride up on horseback over the 106 steps. The second terrace, 35 feet high and 550 feet long, has at the entrance of a great propylæa, attributed to Xerxes, portals with four figures of winged bulls, two of them with men's heads, closely resembling the Assyrian statues in Nineveh. Southeast of the propylæa is Xerxes' throne room with 13 great columns 64 feet high and 29½ feet apart, still standing; it seems to have been open to the air. At one side is the enclosed pavilion of Darius, 250 feet square, which had 100 columns. North of Takhti Jemshed are the tetragonal pyramidal remains of an ancient fire temple. Consult Curzon, ‹Persia› (1892); Dieulafoy, ‹L'Art antique de la Perse› (1884–89) and Mme. Dieulafoy, ‹La Perse, la Susiane et la Chaldée; Fergusson, ‹The Palaces of Nineveh and Persepolis Restored› (1851); Stolze and Andreas, ‹Die achämenidischen und sassanidischen Denkmäler und Inschriften von Persepolis› (1882); and Stolze, ‹Persepolis› (1892).

PERSEUS, pėr'sūs, last king of the Macedonians, son of Philip V: b. about 212 B.C.; d. Alba, Italy, about 163 B.C. He succeeded to the throne in 179 B.C., renewed the treaty with Rome which his father had been preparing to break, but continued the preparations for war in which he had been engaged. In 168 B.C. the Romans sent Lucius Æmilius Paulus against him, and after a campaign of 13 days the Macedonian army was routed. Perseus escaped to Samothrace, but was captured by the Romans and died in honorable captivity at Alba some years later. Consult Droysen, ‹Geschichte des Hellenismus› (2 ed., 1877–78); Mahaffy, ‹Alexander's Empire› (1888).

PERSEUS, fabulous Greek hero, son of Danaë and Zeus, and grandson of Acrisius. In consequence of an oracle which had foretold that Acrisius would die by the hands of a son of Danaë (See DANAË) he was sent to sea on his birth, in a chest with his mother. But the chest reached the Island of Seriphos, and on being opened both mother and son were found to be alive. Dictys, a fisherman who found them, conveyed them to his brother, Polydectes, king of the island, at whose court Perseus was brought up. Polydectes at first treated Perseus with kindness but when he was grown up became anxious to get rid of him, as he thought he would prove an obstacle in the way of his gratifying a passion which he had conceived for his mother Danaë. Under pretense, therefore, of suing for the daughter of Œnomaus, he requested from his friends presents of rarities to make his wedding feast more splendid; and when Perseus professed willingness to bring him anything that he desired, even the head of the Gorgon Medusa, bade him bring what he had mentioned. Conducted by Hermes and Athena, he first went on to the western coast of the ocean, to the three Graiæ, who had but one eye and one tooth in common. Perseus got possession of these, and promised to restore them on condition that they would bring him to the nymphs, who kept the instruments which he needed in this enterprise — the talaria, or winged shoes, the bag, and the helmet of Pluto, which made its wearer invisible. Led by Hermes and Athena, he reached the slumbering Gorgons. With his face averted he approached the monsters whose look transformed the spectator into stone, saw the head of Medusa by reflection in his brazen shield, and cut it off. Upon his return, he transformed Polydectes, with all his associates, into stone; and having placed Dictys upon the throne of Seriphos, returned to Hermes the talaria, bag and helmet, and gave to Athena the Gorgon's head which she fixed in the centre of her shield, or, according to some, on her breastplate. Perseus then went to Argos to visit his grandfather, Acrisius. To avoid the predictions of an oracle Acrisius had fled to Thessaly, but could not escape his destiny, for Perseus followed him there and killed him accidentally with the discus, of which he was the inventor. In consequence of this event he refused to ascend the throne of Argos, which had thus fallen to him, and exchanged it for Tiryns, the kingdom of Megapenthes. Here he founded Mycenæ.

In astronomy, a northern constellation of Ptolemy, exceedingly rich in objects of interest. In a good telescope the double cluster in the Sword-handle appears wonderfully rich in stars. Persues contains the variable star Algol (q.v.).

PERSEVERANCE, or FINAL PERSEVERANCE, generally referring to the doctrine that the salvation of any individual has been absolutely fixed from eternity, and that after the work of salvation has actually been begun, it will be carried forward without fail to a successful termination. (Consult Romans viii, 28-30). The Westminster Assembly's Confession of Faith declares: «This perseverance of the saints depends not upon their own free-will, but upon the immutability of the decree of election flowing from the free and unchanging love of God the Father; upon the efficacy of the merit and intercession of Jesus Christ; the abiding of the Spirit, and of the seed of God within them; and the nature of the covenant of grace — from all which ariseth also the certainty and infallibility thereof.»

In the Arminian theology the possibility and even danger of the falling away of saints is admitted, and it is declared that free-will governs in the adherence to Christ, and does not cease to govern in the abandonment of him. The Calvinist, in argument, does not deny such conditions, but insists that the absence of perseverance in itself proves that actual salvation was never begun for those who afterward became backsliders.

In the Roman Catholic theology the term Final Perseverance signifies the preservation of the state of grace till the end of life on earth; that is, from the last conversion until death — regardless of previous lapses. It is viewed both as a power, and as a fact: In the first sense the combination of spiritual means whereby it becomes possible for the human will to persevere; in the second, an accomplishment by the constant aid of divine oversight and care, and in its eventuality a divine gift, beyond any merit achieved by the human devotee. Consult Hodge, C., 'Systematic Theology' (New York 1877); Newman, Cardinal, 'Tracts Theological and Ecclesiastical' (London 1874).

PERSHING, Cyrus L., American jurist: b. Youngstown, Westmoreland County, Pa., 3 Feb. 1825; d. Pottsville, Pa., 29 June 1903. He sustained himself as a clerk and teacher at Jefferson College, Pa., where he was graduated in 1848, and was admitted to the bar in 1850. He practised his profession in Johnstown, Pa., and was elected to the legislature in 1861, 1862, 1863, 1864 and 1865. In October 1872 he was elected president judge of Schuylkill County, presiding during the trial of the members of the «Molly Maguire» association, and was nominated for the governorship of his State by the Democrats in 1875. He was a frequent contributor to the law journals of Pennsylvania.

PERSHING, John Joseph, American general: b. Linn County, Mo., 13 Sept. 1860. He was graduated at the United States Military Academy at West Point in 1886 as senior cadet captain, when he received his commission of second lieutenant in the Sixth United States Cavalry, and saw his first active service in the same year in the Apache Indian campaigns in Arizona and New Mexico. In 1890-91 he took part in the Sioux campaign in South Dakota, commanding for a time the Sioux Indian scouts. Appointed military instructor in the University of Nebraska in 1891 (where he took his LL.B. degree), and transferred to the 10th Cavalry as first lieutenant in 1892, Pershing continued his lectures at the university till 1895, and two years later became instructor in tactics at West Point. He won special commendation in the Cree campaign of 1896, and in 1898 was made chief ordnance officer in the volunteers with the rank of major, served in Cuba and organized the Bureau of Insular Affairs there, acting as chief of that department till August 1899, when he left the volunteers and was sent to the Philippines. For four years he was engaged there as adjutant-general in the department of Mindanao and in command of the military operations against the Moros, a «fierce, proud and restive» tribe of Mohammedans that had defied Spanish authority for centuries. Pershing's unqualified success in subjugating the Moros and even winning their confidence and friendship was a skilful exhibition of military and diplomatic talents that did not fail to attract the attention of the authorities at Washington. In his message to Congress on 7 Dec. 1903 President Roosevelt paid a handsome tribute to Captain Pershing's achievements. Criticizing the inadequate system of promotion and reward for meritorious service, the President wrote, «The only people who are contented with a system of promotion by mere seniority are those who are contented with the triumph of mediocrity over excellence. . . . Moreover, when a man renders such service as Captain Pershing rendered last spring in the Moro campaign, it ought to be possible to reward him without at once jumping him to the grade of brigadier-general.» The President's words aroused considerable opposition both in Congress and in army circles. The matter was held up for nearly three years, but on 15 Sept. 1906 it was officially announced that Captain Pershing was promoted to brigadier-general over the heads of 862 officers who ranked him in the service. Meanwhile, during 1905-06, Pershing served as military attaché at Tokio and spent a year with General Kuroki's army in the Manchurian campaign against Russia, thus gaining valuable experience of modern warfare and large-scale operations. The next years were spent in departmental and routine duties till the Mexican imbroglio of 1915, when Pershing was placed in command of a punitive expedition against the bandit Francisco Villa. While engaged on this service, stationed at El Paso, Tex., a sad domestic tragedy befel him. In 1905 Captain Pershing had married Miss Francis Warren, daughter of Senator Warren

GENERAL JOHN JOSEPH PERSHING

Commander-in-Chief of the American Expeditionary Force in France (1917-1919)

of Wyoming. Four children were born to them. On 27 Aug. 1915 Mrs. Pershing and her three little daughters lost their lives by a fire in the Presidio at San Francisco. The son, a boy of five, alone was rescued.

On the entrance of the United States into the European War, Pershing was chosen (18 May 1917) to command the American Expeditionary Force to be sent to Europe. He preceded the troops with his staff of 53 officers and 146 men and arrived in England 8 June 1917. After studying military conditions and conferring with the king, ministers and officials, Major-General Pershing proceeded to France, arriving at Boulogne on 13 June. On 4 Oct. 1917 the United States Senate revived the ranks of general and lieutenant-general, and Pershing was elevated to full general, being the eighth American soldier to hold that rank since Washington. The object of the change was to place the American commanders in Europe on a level with those of the Allies. The great German offensive which opened 21 March 1918 and almost brought disaster upon the Allies led to the appointment of General Foch (q.v.) as generalissimo on the Western front and brought about that unity of action already long overdue. At a critical moment General Pershing placed the whole of his forces at the disposal of General Foch in the name of the President and people of the United States. On 3 Aug. 1918 the French government conferred the Grand Cross of the Legion of Honor upon General Pershing in recognition of the great services he rendered to the Allied cause. On that occasion Premier Clemenceau telegraphed to the general: «France shall never forget that it was at a moment when the struggle was most bitter that your splendid troops came to add their efforts to ours. This cross shall be the symbol of our gratitude.» At the close of the war General Pershing received the American Distinguished Service Medal. He was also decorated with the Grand Cross of the Order of the Bath (British), Grand Cordon of the Paulownia (Japan), Grand Cross of Saints Maurice and Lazarus (Italy), the Order of Leopold (Belgium) and the Cross of the Military Order of Michael the Brave (Rumania). The British decoration carries with it the title of «Sir.» His official report on the part played in the war by the American army was published 5 Dec. 1918. Consult MacAdam, G., 'The Life of General Pershing' (*World's Work*, New York, November 1918 et seq.); Tomlinson, E., 'The Story of General Pershing' (New York 1919).

PERSIA (Persian *Irán*), a kingdom of western Asia situated between lat. 25° and 39° 45′ N. and between long. 44° and 63° E.; area, about 628,000 square miles; population, about 9,500,000. According to various treaties with Russia and Turkey, and the Seistan-Afghan Boundary Commissions of 1870 and 1905, Persia is bounded on the north by Russian Transcaucasia along the river Aras (Araxes) to the plain of Mogan and the Lenkoran district (both Russian) on the Caspian; by the coast of the Caspian, and the former Tekke Turkoman country, now known as the Russian Transcaspian territory. This last-mentioned frontier is not definitely fixed. On the west, Persia borders on Asiatic Turkey, though here, again, the frontier line is still in dispute. On the southwest and south the Persian Gulf and the Arabian Sea form natural frontiers. On the east, toward Afganistan and Baluchistan, the boundary was fixed by the Perso-Seistan Boundary Commission of 1903–05; here the dividing line runs from Sarakhs on the Russo-Persian frontier (southeast of Merv) down to Gwattar on the Arabian Sea. Persia thus forms an irregular triangular mass with a base running from below Mount Ararat for about 1,000 miles southeast to the Gulf of Oman, and with nearly equal sides of 700 miles north and east from Ararat to Sarakhs, and thence southward to Gwattar, in long. 61° 30′ E. The entire coast line on the south and west is over 900 miles.

Topography.— The centre of Persia is a vast plateau with a mean altitude of from 3,000 to 5,000 feet above sea-level, but it is by no means a flat tableland, for the country is almost everywhere traversed by lofty ranges to such an extent that the strictly highland really prevails considerably over the plateau formation. With few exceptions the ranges run diagonally from northwest to southeast. Some of the ridges run for over 100 miles at mean altitudes of from 8,000 to 10,000 feet, rising in some places to 16,000 or 17,000 feet. So far as it is yet known, the most extensive and loftiest range is the Koh-Dinár, traversing the western province of Fars at an elevation of perhaps 17,000 to 18,000 feet. Although still unexplored it is plainly visible from the Perisan Gulf 130 miles away over intervening coast ranges known to be 1,000 feet high. The mountain range of southern Persia presents a succession of parallel ridges and valleys so that it is possible to drive between the ranges for some hundreds of miles. In the Elburz chain running over 500 miles from west to east and fringing the south coast of the Caspian, stands the giant Damavand, a volcanic mountain of about 19,000 feet high. This range continues on the eastern flank where it is known as the Ala-Dagh, and varies from 8,000 to 10,000 feet above sea-level, with numerous valleys interspersed, joining the Paropamesan range in Afghanistan. The separate ranges in the northwest merge in the general highland systems of Luristan, Kurdistan and Armenia, where several peaks rise to 15,000 feet. The parallel ranges in the northwest running southeast toward Baluchistan reach their greatest heights in the province of Fars and in the Bakhtiari district. The valleys between them are extremely fertile. The Kuruh-Koh range, running southeastward to Yezd, maintains a height of 10,000 feet for a long distance and is continued toward the Koh-i-Basmán (10,000 to 12,000 feet) by the snow-topped Koh-Banán and other lofty ridges, culminating with the Koh-Hazár (14,500 feet). In Sarhád, southeast of this point, the volcano Koh-i-Naushada rises to nearly 15,000 feet. In recent years it has been determined that the northern scarp of Khorasan is an eastern continuation of the Caucasus, and not of the Elburz Range. As the edges of the great Iranian Plateau are all higher than the earth level of its interior, hardly any of the rivers and streams find their way to the sea, but lose themselves in marsh and desert, e.g., the river Nendeh Rud, on the banks of which Isfahan is built, ends abruptly in a broad shallow lake on the wide plain below. The general tendency of the plateau is to rise toward all the seaboards and the western and northern frontiers. The traveler from Europe desiring to reach Teheran via the Caspian Sea must cross the Elburz Range; to penetrate the interior from the Persian Gulf, he must first overcome formidable mountain barriers and lofty passes. Between the coast ranges and the sea there is but little arable soil excepting, on the Caspian, the delta of the Safi-Rud, and a few strips along the Persian Gulf. This geographical inaccessibility has no doubt contributed largely to the backward state of the country in regard to civilization and prosperity. Once inside the natural ramparts of Persia, however, the traveler may find large tracts of fertile plains and valleys and still larger regions of dreary desert, waste and salt marshes, totally unfit for human existence or cultivation. Besides the rich plain of the Urmia Basin in the extreme northwest, extensive level tracts occur everywhere between the mountain ranges. A great portion of eastern Persia is occupied by the Great Salt Desert of Khorasan (Dasht-i-Kavir) and the Desert of Lut further south. These salt marshes, named *Kavir* in the north and Kafeh in the south, collect the rainfall and all the water from surrounding streams and form dangerous quagmires through which nothing can pass. There are several of such formations of considerable extent north of Kum, west of Yezd and south of Khaf. All the lakes are salt water, the greatest, in the northwest is Lake Urumieh; south of Teheran lies the Darya-i-Namák (Sea of Salt), while about 30 others are scattered through the country. The lakes have a curious habit of shifting their beds and moving from place to place. A "new" one made its appearance in 1883 which, according to the late Shah Muzaffar-ed-Din, was a lake that had dried up 1,300 years ago. Sterility and poverty are the predominant features of Persia. Great barren plains and equally bare mountains are the rule; for many miles not a tree, a shrub or a blade of grass is to be seen, and only camel-thorn and veitch are sparsely dotted about on the arid ground. At intervals the monotony is relieved in the spring by the green of the young crops around towns or villages. The only islands on the Persian Coast are the Kishm group in the Strait of Hormuz, claimed by the sultan of Oman, and the adjoining islands of Larak and Hormuz, belonging to Persia.

Hydrography.— The Karun is the only navigable river in Persia. Situated in the west, it rises in the Bakhtiari Mountains, flows by Shushter and Ahwaz into the Shatt-el-Arab above Mohammerah through an artificial channel, 45 miles from the Gulf, though a portion of its waters continues through its natural bed, the Bahmanshir, east of the Shatt-el-Arab, to the head of the Gulf, though on Persian territory. The Karkhá and Jarahi, the next largest rivers, also flow from the Luristan and Kurdistan highlands into the Shatt-el-Arab. South of the Karun flows the Tab, a sluggish waterway that helped to form the Arabistán delta, one of the richest alluvial plains of Persia. Still further south, the Minab drains all the wide plains across the hills of Bandar Abbas and flows by the town of Minab into the Strait of Hormuz. The largest river flowing into the Caspian (east of Rasht) is the Safid-Rud (White River), which drains an area of 25,000 square miles south and east of Lake Urumieh. The Gurgan and Atrak (the latter perhaps eventually becoming the Russian frontier) reach the Caspian on the southeast coast below Chikishliar. The Keshef-Rud rises near Kabushan, joins with the Hari-Rud and forms the Tajand, which expands to a swamp short of reaching the Caspian. There are numerous inland rivers which lose themselves in lakes or deserts, the principal being the Aji-Chai and Jaghatu, flowing to Lake Urumieh; the Hamadan-Rud and Shurab, disappearing in the Great Kavir; the Zainda-Rud, watering the Isfahan district and running dry in the salt marsh of Gavkhana; the Kur (Bend-amir), chief feeder of the salt lake Bakhtegan (Niriz); and the Mashkel, which filters along the Baluchistan frontier northward to the Hamun-i-Mashkel in the Karan desert.[*]

Climate.— There is a great diversity of temperature and rainfall, ranging between excessive heat and extreme cold. The moist, sultry and unhealthy climate round the Caspian and the Persian Gulf is entirely the opposite of the usually fine climate of the plateau, where the air is dry and exhilarating, enabling the vision to travel almost incredible distances. Yet extremes of heat and cold alternate in the interior; heavy snow falls during the winter in the northern parts from November till the middle of March. Though the sun may shine fiercely by day, the temperature falls as low as 15° or 20° at night. The summer heat is so intense that many escape to the hills to avoid it. Northwest and southeast winds prevail throughout the year with considerable uniformity, their direction being largely determined by the Black and Arabian seas and the parallelism of the intervening mountain ranges. These currents often meet on the southwest coast with the result that while a northwest gale is raging at Bushire on the Gulf, Bandar Abbas further south is exposed to the blazing fury of a southeaster. Violent sandstorms are frequent in the spring in the desert provinces, and hailstorms in which the stones are as large as marbles occur at the same season in the north. In one day's march a traveler may start from a frost-bound region and descend into a tropical zone of luxuriant palms and overwhelming heat. In Arabistán the dry heat in summer reaches over 120° indoors. To the extreme east, again, the climate is very unhealthy and excessively hot. Rainfall is scanty; about 50 inches fall annually at Resht on the Caspian and only five or six inches in central and southeast Persia. But for the mountains storing moisture in shape of snow, nine-tenths of Persia would be the arid desert that half of it is now. The rivers being few and small and the lakes all salt, most of the cultivation has to be carried on by means of irrigation, mountain-streams being conveyed to the towns by subterranean aqueducts requiring incessant labor to keep them open. Artificial canals and a system of wells connected by underground channels are also employed through the greater part of the country.

Flora and Fauna.— The deficiency of water

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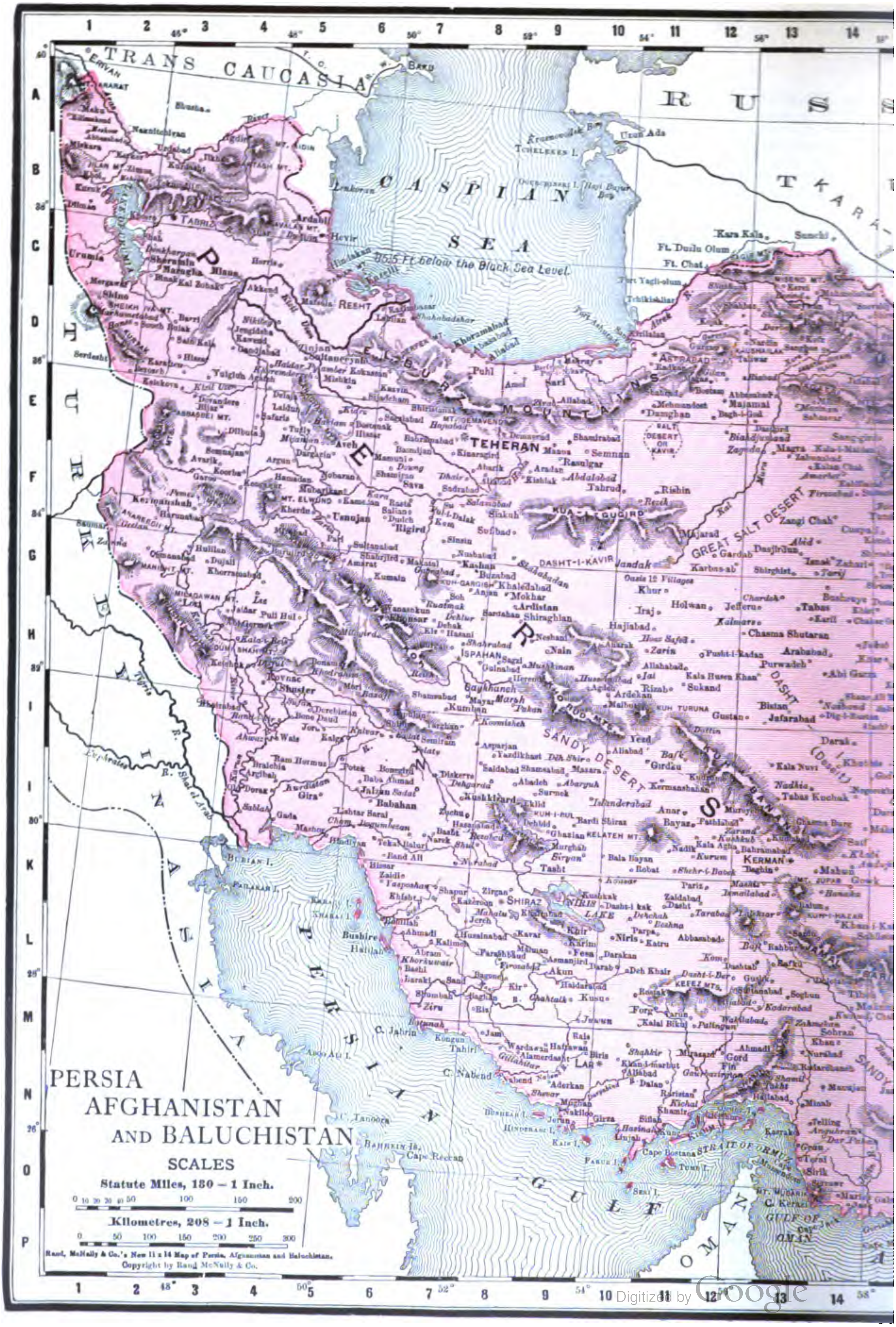
[*] The inland drainage of Persia amounts to nearly two-thirds of that for the whole Iranian plateau (of which Persia is the western section), covering an area of about 1,000,000 square miles.



PERSIA AFGHANISTAN AND BALUCHISTAN

SCALES

Statute Miles, 180 – 1 Inch.

Kilometres, 208 – 1 Inch.

Rand, McNally & Co.'s New 11 x 14 Map of Persia, Afghanistan and Baluchistan.

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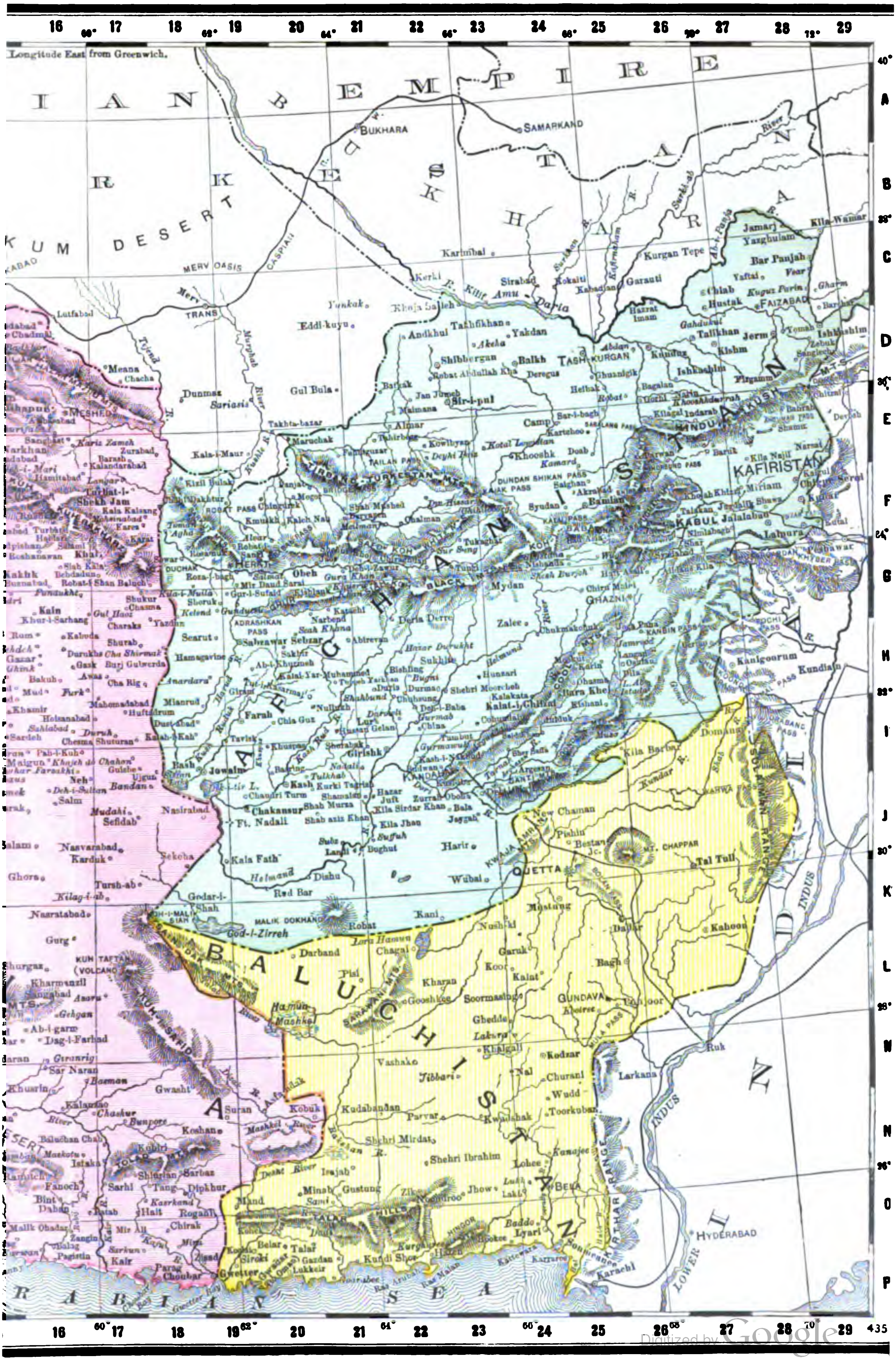
Longitude East from Greenwich.
16
60°
17
18
62°
19
20
64°
21
22
66°
23
24
68°
25
26
70°
27
28
72°
29
40°
A
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38°
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36°
E
F
34°
G
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32°
I
J
30°
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L
28°
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26°
O
P
RUSSIAN EMPIRE
TURKESTAN
BUKHARA
SAMARKAND
BOKHARA
KUM DESERT
MERV OASIS
Merv
TRANS CASPIAN
Amu Daria
Kerki
Karimbal
Sirabad
Kurgan Tepe
Kila Wamar
Jamarj
Yazghulam
Bar Panjah
Faizabad
Gharm
Andkhui
Takhtikhan
Yakdan
Akcha
Shibbergan
Balkh
Tash Kurgan
Kunduz
Talikhan
Jerm
Kishm
Ishkashim
Eddi-kuyu
Yunkak
Khoja Salieh
Lutfabad
Meana
Chacha
Dunmaz
Sariasis
Gul Bula
Maimana
Sir-i-pul
Takhta-bazar
Maruchak
Almar
Kala-i-Maur
Kizil Bulak
Robat Pass
Herat
Obeh
Tirband-Turkestan Mts.
Safed Koh
Kohistan
Hindu Kush
Kafiristan
Kabul
Jalalabad
Lalmura
Pishawar
Khyber Pass
Bamian
Akrabad
Syudan
Ghazni
Koh-i-Baba
Paropamisus
Black Mts.
Hazara
Mydan
Zalee
Chukmakchuk
Kanigoorum
Kundian
Gomal Pass
Sulaiman Range
Afghanistan
Meshed
Turbat-i-Sheikh Jam
Kuh-i-Kurambar
Adraskan
Sabzawar Sebzar
Ab-i-Khurmeh
Kalat-i-Ghilzai
Farah
Girishk
Kandahar
Jowain
Kash
Chakansur
Ft. Nadali
Kala Fath
Helmand
Dishu
Rud Bar
Gedar-i-Shah
Koh-i-Malik Siah
God-i-Zirreh
Malik Dokhand
Robat
Kani
Kila Jhao
Boghut
Harir
Wubal
Quetta
Kwaja Amran Mts.
New Chaman
Pishin
Bestan Jc.
Mt. Chappar
Tal Tull
Kila Barba
Domandi
Kundar R.
Mustang
Dadar
Kahoon
Bagh
Gundava
Shahpoor
Larkana
Ruk
Indus
Baluchistan
Lora Hamun
Chagai
Pisi
Kharan
Darband
Hamun-i-Mashkel
Sarawan Mts.
Gooshkee
Soormastingo
Kalat
Nushki
Khalgali
Kodzar
Nal
Churani
Wudd
Toorkuban
Vashaka
Tibbari
Kudabandan
Parvar
Kwadshak
Shehri Mirdat
Shehri Ibrahim
Lohee
Bela
Kanajee
Kirthar Range
Hyderabad
Lower Indus
Karachi
Sonmeanee
Lyari
Baddo
Hingor
Kurgohi
Kundi Shor
Gardan
Talar
Siroki
Gwetter
Zuad
Parag
Choubar
Kalr
Mand
Minah
Sami
Gustung
Jhow
Kej
Irajah
Dusht River
Kobuk
Mashkil River
Suran
Gwasht
Kuh-i-Safid
Koshane
Bunpore
Chashur
Kalandao
Sarbaz
Dipkhur
Sarhi
Fanoch
Bint
Dahan
Malik Ohadar
Kuh Taftan (Volcano)
Nasratabad
Gurg
Kilag-i-ab
Turshab
Sekoha
Nasirabad
Sefidab
Nasvarabad
Karduk
Salm
Bandan
Neh
Ghora
Shurgaz
Persia
Arabian Sea
Guetter Bay
Ras Arubah
Ras Malan
Kaltewara
India

is naturally reflected in the poverty of vegetation. Except on the outer slopes of the coast ranges hardly any trees or large shrubs are to be found. Along the Persian Gulf and the Arabian Sea the date-palm flourishes, the staple food and chief product of the country. The trees of the Bakhtiari and other inner ranges are mostly stunted in growth. Only on the northern slopes of the Elburz range are the true forests of the country — dense, large tracts of oak, elm, cedar, beech, box and walnut. The eastern plains of Khorasan and Karman are almost destitute of vegetation — a region of sands and salt. In some parts flowers are abundant, roses flourishing so profusely that they are cultivated for perfume. The Caspian provinces have also an exuberant vegetation and innumerable streams. The eastern province of Seistan is very fertile, but abounds in malaria and insect pests that breed in the great lagoon of Hamun. Along the Caspian seaboard wild animals are plentiful; hyæna, leopard, tiger cheetah, wild ass, jackal, lynx, porcupine and smaller beasts of prey. Lions exist in Farsistan. Wild goats, bustards and pheasants are hunted. The bulbul or Persian nightingale is celebrated in oriental poetry. The Gulf and the Caspian are rich in fish, the sturgeon fisheries in the rivers flowing into the latter are highly productive, but are exclusively operated by Russians. Fresh-water fish are rare, the numerous lakes being nearly destitute of animal life. The domestic animals are generally of inferior stock, though the Mazandaran black cattle are highly prized. Camels and mules are employed as carriers for the plains and highland regions respectively; a useful breed of small horses of mixed Arab blood is noted for speed. The famous «Persian cat» is well known in the West. Persia is infested with numerous weird types of reptiles, spiders and insects.

Minerals.— Though Persia possesses great mineral wealth, very little has been done to develop mining industries owing to the lack of communications. Lead and copper mines have been worked from time immemorial. Coal is mined about Tabriz in the north and Laristan in the southwest; iron, lead and copper occur in the Khamesh region and in Khorasan; coal and zinc are found near Teheran and tin in Azerbaijan; manganese ore, coal, lead and copper in Kerman. The famous turquoise mines near Naishapur have been known for ages. Between the Salt Sea and Isfahan the country is rich in iron and copper pyrites and mercury. There is also a quarry of Yezd marble, Yezd and Kerman, where Tabriz marble is also found. The pearl fisheries on the Gulf are very valuable, but are mainly worked by foreigners.

Population.—As already stated, the population of Persia is estimated at about 9,500,000. Under this estimate the inhabitants are distributed approximately — town residents, 2,500,000; peasants, 5,000,000; nomad tribes, 2,000,000. The nomad tribes are mainly Turks, Kurds and Leks, Arabs, Lurs, Baluchis and gipsies. The town residents in the principal cities are — Teherán, the capital, 280,000; Tabriz, 200,000; Isfahán, 80,000; Meshed and Kermán, each 60,000; Bârfurûsh and Shiráz, each 50,000; Yezd, 45,000; Resht, Kum, Hamadán, Kermansháh, Kashán and Kazvin. each 30,000 to 40,000. Smaller towns are Dizful, 25,000; Nenjan, 24,000; Shushter Bandar Abbas and Burnjird, each 20,000; Sari and Mohammerah, each 15,000; Naishapur, 12,000; Astrabad and Bushire, each 11,000. By far the bulk of the people (over 6,000,000) belong to the indigent Iranian stock, Aryans, like the whites of Europe and America. The true Irani resembles the Spaniard or Italian in appearance. The frequent invasions of Persia by Central Asiann tribes have left a strong element of the Mongols — Tartar type, while from the north and west were introduced into Persia the Arabs, Chaldeans, Jews and Armenians. The Persians proper, or western Iranians, are called Tajiks or Tats. There is little spiritual affinity between the Persians and the Turk; the latter is more serious and speaks little, while the former rather approximates to the French type — nervous, artistic, voluble, witty and polite. The moral and mental temperament of the Persians is not highly advanced. Ages of despotism have left the stamp of cruelty upon the Persian, which is exemplified in the savage sentences imposed by justice and the cold-blooded manner in which they are carried out under the indifferent gaze of the public. The natives of Kharasan show traces of Mongol and Usbeg blood in their broad, flat faces, high cheek-bones and brusque manner. The Persian Gulf is bordered by Arab tribes and throughout the whole country a shifting, nomad population, the Iliats, drive their cattle and carry their homes up into the hills in spring and summer and seek the warmer plains in winter. Their women are not veiled, like those of the towns and villages; adorned with valuable jewelry, they look not only healthy but happy, which latter is far from being the lot of the average Persian woman. There are about 1,200 Europeans, half of whom are British.

Religion and education.— The Persians belong almost exclusively to the Shiah sect of Islam; like the Turks, many of the Arab and Turki tribes as well as the Kurds belong to the rival faction, the Sunnites. The Lurs of the Bakhtiari region are nominally followers of the prophet, yet they possess neither mosques nor priests. Babiism (q.v.) counts many adherents, while there are about 10,000 Parsis or Guebres, some 50,000 Armenians and 30,000 Nestorians (both Christian), and about 43,000 Jews. Other religions are represented by Catholics, Greek Orthodox, Protestants and Zoroastrians. The chief priest of the Shiites resides in the holy city of Kerbela, near Bagdad.

Until recent years education was in a very backward state, being limited to reading the Koran in Arabic, which few were able to understand. There are now numerous schools on European lines to the number of about 200, with some 15,000 pupils of both sexes. A ministry of education and an educational council have been created to supervise and co-ordinate public instruction. The government maintains numerous colleges where some scientific knowledge may be gained besides Persian and Arabic literature. Since 1849 there has been a polytechnic school in Teheran equipped with European instructors, to which four French professors were added a few years ago. Military colleges exist in the capital and Tabriz, and a German school, partially subsidized by

German funds, was opened in 1907. The Alliance Française supports a French school. A political college or civil service institution trains pupils for diplomatic and foreign office service.

Political Divisions.— Persia is divided into 33 provinces of very unequal size, the principal ones being, in the north, Astrabad, 10,000 square miles, pop. 250,000; Mazandaran, 8,000 square miles, pop. 500,000; Ghilan, 6,000 square miles, pop. 600,000; Azairbijan, 35,000 square miles, pop. 1,700,000; in the west, Irak-Ajemi, 115,000 square miles, pop. 1,800,000; Ardelan, 6,000 square miles, pop. 200,000; Khuzistan, 30,000 square miles, pop. 800,000; Luristan, 30,000 square miles, pop. 400,000; Farristan, 60,000 square miles, pop. 1,500,000; in the south, Karman, with Kohistan, Makran and Seistan, 150,000 square miles, pop. 820,000; and in the east, Khorasan, 140,000 square miles, pop. 960,000; Kermanshah, pop. 425,000. Though three times the size of France, where the population is 190 to the square mile, that of Persia is slightly less than 15 to the square mile.

Government.— Until 5 Aug. 1906 the Shah was an absolute autocrat. On that day the then reigning Shah, Muzaffar-ed-Din, issued a decree convoking a Mejliss or national assembly, and a constitution, dated 1 Jan. 1907, was confirmed on 11 Feb. 1907 by his successor, Mohammed Ali. In October of the same year a new constitution limited the ruler's prerogatives and ecclesiastical authority, granted liberty of conscience, of the person, education, speech, press and associations and defined the responsibility of ministers and the duties of Parliament. The Shah violated and abolished the constitution in November 1908. Yielding to diplomatic pressure by Great Britain and Russia, he granted another constitution and electoral law in June 1909. By this law, under which the elections were held shortly after the Shah's deposal in July, the Mejliss consists of 120 deputies, 40 forming a quorum. The Mejliss was dissolved in December 1911, and did not meet again until 1915. (See *History*). The provinces are governed by governors-general directly responsible to the central government, with power to nominate their subordinate lieutenant-governors. The towns have mayors or chief magistrates, while every parish of a town has its local chief. The nomad tribes also have their chieftains, who are responsible for the collection of taxes among their people. Practically all male subjects are entitled to vote in municipal elections.

Justice.— The administration of justice is vested in the provincial governors, the Sheikhs-ul-Islâm and the Mohammedan priesthood, which produces a conflicting code based upon a mixture of unwritten common law and divine law according to the Koran. Bribery, corruption and perjury are the rule rather than the exception in legal procedure, while the criminal code is somewhat barbaric. Appeal does not exist.

Army.— The army is Oriental in character and, consequently, extremely loose in organization and defective in equipment. Various European officers — principally Russian — have attempted to instil Western discipline into the army, with but poor results. Troops are recruited from districts according to certain prescribed quota. Christians and Jews are exempt on payment of a tax. The regular and irregular troops are probably about 110,000 in number. A Cossack brigade, composed of Persians drilled by Russian officers, is stationed at Teheran, while the Russian government until recently maintained a similar body at Tabriz. In September 1915, owing to lack of payment, a Gendarmerie force of 7,000 men officered by Swedes was disbanded. In several of the large cities the police are commanded by Swedish officers. The navy is insignificant; the half-dozen small vessels composing it being engaged by the customs department.

Agriculture and Industry.—Though the Persian is by nature more adapted to trade than agriculture, the bulk of the people are perforce engaged in cultivating the soil. From the fertile regions come rice, wheat, barley, fruit, dates, drugs, gums, silk, wool and cotton. Persian carpets and rugs, made by the peasantry in wretched hovels, are celebrated throughout the world, attracting fancy prices enormously in excess of their cost of production. Opium, pearls, precious stones and skins are exported. The lack of internal transit and manufactories compels the Persians to import many items which, under more favorable conditions, their own country could produce. The greatest trade before the war was with Russia; the British Empire came second, Turkey third and Germany fourth. The principal ports are Bushire, Bandar Abbas, Mohammerah and Lingah. In the year before the war broke out, German shipping entered amounted to nearly 2,000,000 tons and little over 1,500,000 tons of British shipping.

Internal Communications.—Persia has only six miles of railroad, running from Teheran to Shah Abdul Azim, run by a Belgian company. The British government subsidizes a British firm of Bagdad to run a fortnightly steamer up the Karun River. The only highways that existed in Persia at the beginning of this century were two roads with a total length of about 300 miles. A number of new roads have been opened since then and others are under construction. The two methods of travel and transport are still the primitive cart — drawn by mules or oxen — and the camel. A regular postal system has been in operation since 1877. There is a weekly service to India via Bushire and another twice a week to and from Europe via Resht or Tabriz and Tiflis. Since 1902 the post office has been united with the customs department and is mainly operated by Belgians. A ministry of posts and telegraphs was created in 1909. About half the telegraph wires in Persia are operated by an English staff, while the Persian government operates its private system by its own staff. Direct telegraphic communication with India was established in 1904.

History.— When one regards modern Persia, steeped in poverty, torn by factions, deluded by political visionaries, infested with brigands, squeezed between foreign powers, even partitioned into spheres of influence, and at the most a big desert surrounded by rocky mountains, "a land where no water is," one is apt to forget that it once meant an empire which stretched from the Indus to the Danube, from the Oxus to the Nile, and that on the shore of the Narrows in the Dardanelles a "Great King" once sat on a marble throne at

Abydos and pored a libation from a gold cup into the Hellespont as the Persian "Immortals" led the way across the bridge of boats to the conquest of Athens. Though the beginnings of Persian history are wrapped in legendary mist, we know that the ancient Persians were Aryans or Indo-Iranians, but at what period they migrated from the East to the plains of Irán cannot be determined, though existing records at least prove that it was prior to 1400 B.C. Some authorities hold that the migration extended over thousands of years, beginning from about 2000 or 2500 B.C. Tradition relates that the Iranians were compelled to forsake their home country, Aryanem-Vaejo, on account of its cold climate. Where that country was located is uncertain. It is generally accepted that the Medes entered Persia from the northwest and settled along the western side of the plateau. The Iranians came from the northeast through Bactria, now known as Balkh, in northern Afghanistan, penetrated somewhere into the northern part of Khorasan, and wandered southward through Kerman to the Persian Gulf. Other migrations followed: Some turned southeast and crossed the Hindu Kush; the Hyrcanians settled on the Caspian coast about Astrabad; the Carmanians (whence the name Kerman) settled in western Persia, while other invaders poured into Afghanistan and Baluchistan, where they made their homes. The Iranians appear to have been the first branch of the Aryan group to adopt civilization and to practise monotheism. They also introduced the horse into western Asia, where it was previously unknown. Before Persia proper came into being there were two Iranian empires side by side on the plateau — those of the Medes and the Persians. We read of Shalmaneser II, king of Assyria, battling with the Medes in 836 B.C., and Sargon exacting tribute from Median princes bearing unmistakably Persian names. About the 7th or 6th century B.C. Zoroaster, a native of Media, developed the religion of fire-worship which still bears his name. In the region which is now included in the Persian provinces of Arabistan, Luristan, Pusht-i-Koh and the Bakhtiari Mountains, due east of Babylon, Basrah and Bagdad, there lay the kingdom of Elam bordering on ancient Sumer and Akkad, more ancient by far than the Median or Persian communities, and over which King Chedorlaomer, mentioned in Genesis (xiv, 9), ruled in Susa — the Shushan of the Bible. "Elam" is the biblical name for Persia. The earliest example of a letter recovered from the ruins of Babylon relates to Elam, and the date ascribed to this document is about 2850 B.C. The aborigines of Elam supposedly were negritos of non-African type, by whom the whole plateau was perhaps at one time inhabited. The influx of Turanian and later of Semitic elements in time absorbed the native stock and modified the language. Various other tribes, Mesopotamian and Iranian, made up the population of Elam. For centuries Elam led a predatory existence, raiding Babylon and Assyria until the latter, under Assurbanipal (668–626 B.C.), entirely destroyed the kingdom in 645 B.C. (Ezekiel, xxxii, 24). Its territory included or adjoined the principality of Anshan or Anzan, over which reigned the first great Aryan recorded in history — Cyrus. In 550 B.C. Cyrus defeated Astyages the Median king, to whom he was related, captured the royal city of Ecbatana and united the two Iranian states under the name of Persia. About 100 years earlier the Medes had thrown off the yoke of Assyria, hence their independence had lasted approximately a century. Cyrus now led his armies into Asia Minor, conquered and captured Crœsus, the king of Lydia, and annexed all the Greek colonies in those regions. The Phrygians, Mysians and other Asiatic tribes submitted to him. For the next five or six years Cyrus was engaged on his eastern borders, either warring against unruly neighbors or preparing his army for the great task he had in view — the capture of Babylon. He certainly subdued greater part of what is now Afghanistan in the meantime. Babylon under Nabonidus was in turmoil; the captive Jews and many other exiles had been encouraged by their prophets and leaders to expect the fall of the city. Cyrus advanced with his host, easily defeated the Babylonian army and entered the city without opposition; mighty Babylon surrendered without a blow to the Persians in 538 B.C.

Until the discovery, within recent years, of the Nabonidus and the Cyrus cylinders, our knowledge of the fall of Babylon was based upon the dramatic story of Herodotus and the book of Daniel. The former is proved to be merely a legend and the latter devoid of historical value. There was no siege of Babylon by Cyrus; the Belshazzar (q.v.) who was killed by Gobryas (the father-in-law of Darius) at the surrender of Babylon was neither the son of Nebuchadnezzar nor king of Babylon.

Cyrus displayed remarkable generosity toward the Jews; he permitted them to return to Jerusalem and restored the gold and silver vessels of the sanctuary. His dominions now included Elam, and, outside of Persia, the Greek colonies Lydia, Babylon and Phœnicia; there yet remained Egypt. He began preparations for the conquest of that country, but died before he could carry out his plans. During his reign of nearly 20 years Cyrus raised Persia to the chief position in Asia by his victories, diplomatic skill and magnanimous character. He fell in battle against Turanians, Tartars or Parthians (accounts differ on this point) in 529 B.C. The circumstantial story of Herodotus connecting the death of Cyrus with the Massagetæ is a legend. Cyrus was succeeded by his son Cambyses, who accomplished the conquest of Egypt in 525 B.C., thereby adding a great province to the Persian Empire. A cruel tyrant, Cambyses had not the ability of his father; he caused his brother Smerdis (Bardiya) to be murdered secretly, and when he himself died by suicide in 522 there was no heir to the throne. A revolt fomented by the Median tribe of Magians resulted in one of their number, Gomates, impersonating Smerdis and seizing the royal crown. He ruled for a year before the imposture was discovered, when Darius, son of Hystaspes, a descendant of the second or Persian line of the Achæmenian princes (Cyrus belonged to the Anshan line), with six other Persian nobles, killed the usurper and all his followers. Darius became king in 521 B.C. and proved himself a born leader of men, a great general and a skilful ruler. He extended his dominions eastward to the Indus and attempted to force a way into Russia, but here the climate defeated him as it did Napoleon over 2,000 years later. The spirit of revolt was abroad in the land. The Greek cities of Cyrene and Barca had submitted to Cambyses. Greek patriotism became inflamed; revolutions broke out in Babylonia and Elam; the governors of other provinces saw opportunities of creating kingdoms for themselves. Darius led his army against Babylon and reduced the city after a two years' siege in 519 B.C., after which he turned against the individual rebels. He quickly overcame all opposition and peace reigned throughout the empire in 518. He divided his realms into satrapies and appointed inspectors with plenary powers to investigate the conduct of administrators. He coined the first Persian money; revenue was raised on a system of assessments and collected in money or kind according to the products of the various districts. Roads were constructed and a great army of levies and regulars was maintained. In 512 B.C. Darius led an expedition into southern Russia against the Scythians, who kept out of his way. On his return journey he reduced the rebellion in Thrace and received the submission of Macedonia. One of his generals, Otanes, compelled the surrender of Byzantium (Constantinople) and burnt it down. A later expedition to India brought the Panjab and Sind (Scinde) under Persian dominion. Persia had reached the zenith of her glory; tranquility and order were enforced by «the law of the Medes and Persians which altereth not.» In 499 B.C. the Ionic revolt broke out and led to the Persian invasion of Hellas. Darius suppressed the Ionian Greeks and dispatched a punitive expedition against Athens and Eretria. It failed in its purpose; a second expedition was more successful. It totally destroyed Eretria and sailed for Marathon, 24 miles northeast of Athens, where some 9,000 Greeks charged into a host of 40,000 to 50,000 Persians and routed them, 490 B.C. Darius I died in 485 B.C. and was succeeded by Xerxes, supposed to be the Ahasuerus «which reigned from India even unto Ethiopia, over an hundred and seven and twenty provinces» (Esther i, 1). His first task was to crush the Egyptian revolt which had broken out in 486. Three years later Babylon rose in arms. Xerxes besieged the city, took it in a few months and delivered it over to be plundered. From this blow Babylon never recovered— her glory faded and the wonder of the Old World sank slowly into oblivion. To redeem the disgrace of Marathon preparations on a vast scale had long been in the making for the conquest of Hellas. Troops were collected from every part of the empire — Persians, Medes, Hyrcanians, Cissians, Assyrians, Arians, Bactrians, Parthians, Sakae, Indians and Ethiopians; infantry, cavalry, archers and spearmen, chariots and Arabs mounted on camels. The Phœnicians supplied 1,200 warships with crews; 3,000 transports were ready to convey the greatest and most picturesque agglomeration the world had hitherto witnessed. Herodotus relates that there were 1,700,000 infantry, 100,000 mounted men, and 510,000 sailors and marines, a total of 2,310,000, though this is considered to be an exaggeration. In the spring of 480 B.C. this huge machine was set in motion. While it moved across two pontoons bridging the Hellespont near the modern Chanak Kalessi, Xerxes poured a libation into the water praying that he might conquer Europe. The Greeks feverishly prepared to meet the approaching avalanche advancing unopposed through Thessaly and Macedonia. With the honorable exceptions of Platæa and Thespiæ, most of the Greek states of northern and central Hellas submitted without resistance before the first battle was fought. The fate of that expedition is known to every schoolboy: the heroic defense of the pass of Thermopylæ by Leonidas and his immortal Three Hundred; the naval battles off Artemisium: the evacuation of Athens to be ravaged by the invaders and the last stand of the Greeks at Salamis, risking all upon a single battle with the result that the Persians suffered a crushing defeat. The Greek victory at Platæa (479) settled for centuries the question as to whether Asia should conquer Europe. Famine and disease completed the work of the Greeks upon the Persian host; King Xerxes fled back to the safe shores of Asia; and Athens began to take her position as the intellectual and artistic leader of the world. The Lacedæmonians under Pausanias took Byzantium from the Persians. Xerxes was murdered by two of his courtiers in 466 B.C. and Persia fell into the hands of incompetent rulers. Despite the magnitude of defeat and loss of prestige, the empire continued to play the leading rôle on the world's stage for another century and a half.

Artaxerxes I (third son of Xerxes) succeeded to the throne as a mere boy. He ruled for 40 years and proved utterly incapable. A second revolt broke out in Egypt (460 B.C.) and the Athenians joined in the struggle against Persia. They sent a fleet to Egypt and defeated the Persians under Achæmenes at Papremis in the Nile Delta and captured Memphis all but the fortress. A Persian army of 300,000 men supported by 300 Phœnician ships appeared on the scene in 456 B.C. and relieved the garrison; the Egyptians and Greeks were defeated and the rebellion collapsed. In 449 B.C. the Greeks came to an agreement with Persia by the Peace of Callias and years of comparative peace followed. Artaxerxes died in 425 B.C. His son, Xerxes II, was quickly murdered when drunk by his brother Secudianus, and another brother, Ochus, became king under the title of Darius II. He was an inhumanly cruel brute; his wife, Parysatis, is said to have surpassed him in bloodthristy temperament. He reigned about 20 years, a period of anarchy, insurrection and degrading villiny at the royal court. Persian military efficiency began to weaken, sapped by excessive prosperity and the king's evil example. Large numbers of Greek mercenaries were enrolled into the army and navy and entrusted with high commands. What had been conquered by the sword was maintained by intrigue and bribery; wealth and luxury began to undermine national strength and spirit. Darius II died in 404 B.C. and was succeeded by his son, Artaxerxes II (Mnemon), despite the efforts of Parysatis to substitute her younger son, Cyrus, who was to become the hero of one of the most remarkable adventures in history. This Cyrus the Younger, described by Xenophon as «a man, of all the Persians who existed after the ancient Cyrus, the most kingly and worthy to command,» left his satrapy in Asia Minor and marched against his brother the king with a composite force of

13,000 Greeks (commanded by Greek officers) and 10,000 Asiatics. The expedition encountered the Persians under Artaxerxes at Cunaxa near Babylon. In the ensuing battle (401 B.C.) the Greeks were victors although their cause was lost; but Cyrus was defeated and slain. The event is vividly related with some exaggeration by Xenophon the Greek historian (q.v.), who accompanied the expedition. After Cunaxa a league was formed between Persia, Athens, Thebes, Corinth and Argos against Sparta, whose fleet was defeated at Cnidus in 394. The long walls of Athens were rebuilt with Persian money, and Sparta was compelled to sign the humiliating Peace of Antalcidas (387 B.C.), so named after the Spartan ambassador. By this peace Persia recovered her lost possessions in Asia Minor. Egypt again rose in defiance under Nectanebo, and Artaxerxes dispatched a powerful expedition in 374 B.C., which had to retire from the Nile without accomplishing its object. After an eventful reign of 46 years Artaxerxes died at the age of 94 in 358. A weak and benevolent ruler, he revived the worship of Mithras. He was succeeded by his son Ochus as Artaxerxes III, in whom exceptional ability was disfigured by an incredible ferocity. He began his reign by murdering nearly all the members — male and female — of his family. He almost succeeded in restoring Persia to her former greatness by crushing every revolt with the utmost brutality. In his campaign against Tennes, king of Sidon, he ordered the massacre of 500 representatives of the people, whereupon the townsmen set fire to their own city and immolated themselves with their families. Ochus crushed the revolt in Egypt, killed the sacred bull Apis and had it served at a banquet; he destroyed cities, murdered thousands of citizens and despoiled their temples. Ochus was in his turn murdered by his capable minister, the eunuch Bagoas, as a means of self-preservation. Most of the king's sons were also put out of the way, and Bagoas placed the youngest, Arses, on the throne (338 B.C.). The eunuch soon found it advisable to murder Arses and selected in 336 B.C. a certain Codomannus as King Darius III, believed to have been a scion of the Achæmenian line, which died out with him. As a safeguard against sharing the fate of his two immediate predecessors, Darius took the precaution of killing Bagoas.

In the same year that Darius III ascended the throne of Persia, the poor and comparatively small kingdom of Macedon in Europe crowned its new king. the great Alexander, a pupil of Aristotle and a military commander at the age of 16. Up to this time Persian armies had carried war into Europe; the turn of the tide was at hand. In 334 B.C. Alexander, then 22 years old, set out to realize the great scheme originated by his father — the conquest of Asia. He led his army of 30,000 infantry and 5,000 cavalry across the Hellespont, defeated the Persians on the Granicus, captured Sardes, Ephesus, Miletus, Halicarnassus and several cities of Lycia and Pamphylia. Turning inland, he crossed through Asia Minor and met the Persian armies of over 500,000 on a plain near the city of Issus. Here, in November 333 B.C., was fought one of the great decisive battles in history. The persians were put to flight with terrific slaughter. King Darius fled, leaving his camp and his family in the hands of the victors. During 332–331 B.C. Alexander captured Tyre and annexed Egypt. Crossing the Euphrates and the Tigris he found Darius awaiting him with an army about 1,000,000 strong at Gaugamela, near the ruins of Nineveh, about 70 miles northwest of Arbela. With only 40,000 infantry and 7,000 cavalry Alexander bore down upon the enemy, broke through his ranks and scattered all before. Darius fled early during the battle, pursued by the Macedonians. After the battle of Arbela (331 B.C.) Alexander was received in triumph in Babylon, whose people welcomed him as their savior. Three weeks later he entered Susa, the capital of Elam; Persepolis, Pasargadæ and Ecbatana fell into his hands. A party sent in pursuit of Darius found his body in a wagon, murdered by order of Bessus, viceroy of Bactria (330 B.C.). Bessus was crucified two years later. The death of Darius ended the Achæmenian dynasty after an existence of 320 years, and Persia became a part of the Macedonian Empire, the annexation being completed by the capture of Balkh in 328 B.C.

Alexander the Great took steps to pacify and consolidate the empire he had won; he mixed Persian soldiers with his own troops and ordered his men and officers to marry the women of the country. He himself married Roxana, the beautiful daughter of the Bactrian chief, Oxyartes, and also, later, Statira, a daughter of Darius. He then began the invasion of India in 327 B.C., a task he did not live to accomplish; a spirit of mutiny and war-weariness among his soldiers ended the Indian campaign in 326 B.C. The sudden death of Alexander at Babylon in 323 B.C. gave the signal for a fierce strife among the generals and satraps for the possession of the empire. Out of the turmoil of civil war one of Alexander's generals, Seleucus Nicator, seized Babylon and founded the Seleucid dynasty. He conquered Susiana, Media and the eastern provinces of Alexander's empire to the Oxus and Indus. Some nomad tribes from north of the river Atrek settled in Parthia (q.v.), the modern Khorasan where Arsaces I founded the dynasty of the Arsacidæ. Of this family, Mithridates the Great (171–138 B.C.), overthrew the Seleucidæ and extended his dominions from the Indus to the Euphrates. His successors ruled over Persia till the revolt of 226 A.D., which brought about the downfall of Parthia and the rise of a new Persian dynasty.

The Sasanian Period.— For over 500 years after the death of Alexander Persia was involved in an ever-changing kaleidoscope of wars, conquests, alliances and revolts, embracing Mesopotamia, India, Rome, Greece, Armenia and the Alani. Under Artaxerxes I (known as Ardeshir) the independent kingdom of Persia was restored after the battle of Hormuz in 226 A.D. and a new brilliant dawned for Iran. From this period, also, dates the beginnings of reliable Persian chronicles unencumbered with legendary embroidery. Ardeshir conquered Armenia, Kerman, Susiana, Media and the greater part of the Iranian highlands. He also revived the neglected religion of Zoroaster and ruled with justice and wisdom. He was succeeded by his son Shapur I in 240 or 241, who led an expedition into Roman territory and captured the Emperor Valerian. But he was later defeated by Odœnathus, husband of the famous Zenobia of Palmyra (q.v.). Shapur founded the city of Nishapur, the birthplace of Omar Khayyam. It was in his reign that the sect known as Manichæans arose, whose leader, Mani, preached a kind of «Christianized Zoroastrianism.» Hormisdas, son of Shapur, reigned only a year and was followed by Bahram I, who, according to Alberuni, «killed Mani, stripped off his skin, filled it with grass and hung it up at the gate of Gundisapur.» Bahram ruled from 272 to 275 A.D. Bahram II (275–282) began as a tyrant, but reformed when threatened with murder; the third Bahram reigned four months and was followed by Narses, who provoked a quarrel with Rome by invading Mesopotamia. At first successful, he was finally defeated by the Romans who captured his wives and children and compelled him to cede much of his territory. He abdicated in 301 and was succeeded by Hormisdas II, who died in 309. The natural heir of the latter was refused the throne and a posthumous son was elected king even before he was born. The expected heir arrived a few months after his father's death and became the famous Shapur the Great. As he died in 379 he was actually king for 70 years, though he did not assume power till he attained his 16th year. He began war against Rome in 337 to regain the lost territory, and in 338 invaded Mesopotamia. With varying defeats and victories the war dragged on for 15 years, to about 352 and was recommenced in 359, ending in 361. Rome and Persia came to grips again in 363. The Emperor Julian fell in battle and his successor Jovian returned to Persia the five provinces ceded by Narses. Under Constantine Christianity had become the official religion of the Roman Empire, a circumstance which led to the barbarous persecution of Christians in Persia under Shapur. That monarch, however, left his country at the height of her glory and power. His successors call for little notice. Ardeshir II (379–383), weak, old and benevolent, was deposed; Shapur III (383–388) made peace with Rome and received a large portion of Armenia. Assassination ended his career, and Bahram IV (388–399) became king. He was killed by his own soldiers. Yezdigird the Wicked (399–420) distinguished himself by his barbarity toward the Christians; Bahram V (420–440), the «great hunter» of Omar Khayyam, is the hero of Persian fable. He continued the Christian persecution; after a short war with Rome, in which he suffered defeat, a mutual agreement was made by which religious liberty was granted to Zoroastrians under Rome and Christians in Persia. In his reign the Eastern Church declared its independence of the Western Church (424). About this time a Chinese tribe known in history as the White Huns crossed the Oxus and ravaged Persian territory. Bahram fell upon these invaders and inflicted a crushing defeat. Yezdigird II (440–457) waged war against Rome and attempted to reconvert the Christians of Armenia by massacre. He persecuted both Christians and Jews, married his own daughter and then murdered her. Hormisdas III (457–459) was overthrown by his brother Perozes (Firuz) with the assistance of the White Huns, against whom he had to fight for the rest of his life. He fell in battle in 483 and Persia became tributary to the White Huns. His successor, Volagases (Balas), was blinded and died in 487. The next ruler, Kobad or Kavádh, was converted to a communistic creed propounded by Mazdak of Persepolis; the king was put in prison by the nobles and replaced by his brother Zamasp. He escaped in 1501, fled to the White Huns and regained his throne. He broke the 60 years' peace with Rome, ravaged Armenia and captured the fortress of Amida. For the next 10 years he fought against the White Huns and broke their power for ever. Roman aggression led to another war in 524, resulting in defeat for the Persians at the hands of Belisarius (q.v.). Kobad was succeeeded in 531 by his son Khosru I (Chosroes) the Just, the most distinguished member of the Sasanian dynasty. He caused the execution of Mazdak and many thousands of his followers. He made a treaty of perpetual alliance with Rome in 533 which he broke in 540, when he led an invasion of Syria, capturing and plundering the rich cities and razing Antioch to the ground. Khosru forced Justinian to pay tribute; he expelled the Abyssinians from Yemen, invaded the White Hun country and thereby recovered Balkh, and attacked the wild Khazars, whom he slew in thousands. In addition to his military ability Khosru possessed the virtues of toleration, generosity and a strong sense of justice. A patron of art, literature, education and science, he organized the state to a high degree of efficiency. Under his reign the so-called «Nestorian» church flourished in Persia. Hormisdas IV (579–590), son of Khosru by a Turkish princess, continued the war with Rome and defeated the Turks. His tyranny and offensive conduct led to his assassination. Khosru II, Parvis (590–629) was immediately attacked by Bahram Chubin, a demoted general, who seized the throne. But the nobles opposed the usurper; with the aid of a Roman army the allies of the legitimate heir crushed Bahram in 591 and restored Khosru to power. The latter declared war on Byzantium in 603 to avenge the murder of his friend, the Emperor Maurice. Persian arms achieved a long series of victories in Mesopotamia and Asia Minor; cities and fortresses fell before them: Dara (605), Edessa, Harran, Hieropolis and Aleppo. Aided by 26,000 Jews the Persians captured and sacked Jerusalem in 614; three years later they took Chalcedon and stood in sight of Constantinople. Alexandria fell in 616 and the Nile Valley, after an interval of nearly 1,000 years, was again in Persian hands. The Emperor Heraclius stemmed the tide at Issus in 622, reconquered all the lost territory and carried the war into Persia. Khosru II was deposed and murdered in 628. Kobad II followed (628); he made peace with Heraclius and returned the True Cross to Jerusalem which his father had carried away. In the following year he murdered his brothers and died of the plague. His son, a boy of eight, was murdered in 630 and a period of anarchy ensued. Eleven rulers — among them two queens — followed in rapid sequence until the accession of Yezdigird III in 634. The last king of the Sasanian dynasty, he was murdered in 652. During his reign the Arabs, galvanized by the new faith of Islam, overran Persia and battered down a desperate resistance that lasted 10 years. Except in Yezd and Kerman the creed of Zoroaster was stamped; Islam was forced upon the vanquished and Persia became a part of the caliphate. The star of Persia had set. After the fall of the Sasanians the country was ruled by despots who were celebrated only for cruelty and incompetence. From the disastrous battle of Nahavand in 642, at which over 100,000 Persians and allies were slain, there followed eight centuries of alien rule, civil wars and invasions. In the 9th century Persia was broken up into petty states; the Turkish Seljuk dynasty later dominated several provinces; the terrible Mongol hordes of Chengiz Khan desolated the country in the 13th century; the grandson of this distinguished savage, Hulagu Khan, killed the last caliph and made himself king. He and his successors governed wisely and tolerated all religions until the arrival of Timur the Lame (Tamerlane) in 1387 with his Tartar hordes. Timur conquered Persia and filled Asia with terror. After his death in 1405 the Mongol dominion collapsed to be superseded by that of the Turkomans for the next 100 years. The Sufi dynasty (1501-1736) brought about that division of Mohammedanism which was vitally momentous to the Islamic world. The new sect (Shia) rejected the infallibility of human wisdom and discarded the Sunni doctrine hitherto the standard of Mohammedan countries. To this day the Shah must belong to the Shia faith. The Sufi dynasty was a national one, descended from the Sasanians. In 1722 the Afghans under Mahmud invaded Persia, settled themselves in Ispahan and captured the Shah.

Taking advantage of the situation, Russia and Turkey deprived Persia of her richest and most important northern provinces. Mahmud, meanwhile, was drenching Ispahan with the blood of her people; at one time 300 Persian nobles were invited to a banquet and murdered; Mahmud had his 3,000 Persian guards butchered, after which an indiscriminate massacre lasting 15 days almost depopulated the royal city. The tyrant himself took a hand in exterminating 39 members of the Sufi dynasty. He died in 1725 and was succeeded by the Afghan Ashraf. Two years later the fugitive Shah, Husayn, was joined by Nadir Kuli, a famous brigand who was destined to become the greatest conqueror of his age. He not only drove the Afghans out but killed the old Shah and his heirs and became Shah himself in 1736. (See NADIR SHAH). After his assassination in 1747 there was a period of over 40 years largely filled with anarchy and the struggles of rival princes. But for 19 years Karim Khan ruled with the title of *wakil* or regent over the whole of Persia except Khorasan.

Modern Persia.— *The Kajar Dynasty*, of Turkish origin, was founded by Agha Mohammed, a eunuch, one of the most cruel and vindictive monarchs that ever disgraced a throne. Upon his conquest of the greater part of Persia in 1794, he ordered a general massacre; 20,000 women and children were sold into slavery and numberless other atrocities followed. He ordered 70,000 eyes of the inhabitants of Kerman brought to him on a platter, and on receiving them he counted them, touching each with the point of his dagger, then turning to his minister he said: «If one had been wanting I would have made up the number with your own eyes.» After a reign of 18 years he was fortunately murdered by his own attendants in 1797. He was succeeded by his nephew, Fath Ali Shah, under whose sanction many acts of cruelty and injustice were committed. He was followed on the throne by his son in 1834. The reign of Mohammed Shah was marked by difficulties with the British government; by the rebellion of Agha Khan Mahlati — «The Chief of Assassins»; by a new rupture with Turkey and the rise of the sect of the Bábis, who afterward led an insurrection. Mohammed died in 1848 and was succeeded by his son Nasir-u-Din Mirza. It was during the reign of Fath Ali Shah that official relations began with England and British India. Mahdi Ali Khan was entrusted by the governor of Bombay with a letter to the Shah. He was soon followed by an English envoy from the governor-general, Captain Malcolm of the Madras army. The results were a political and commercial treaty and a return mission to India from Fath Ali Shah. In 1887 Sir Henry Drummond Wolff was appointed as the British Minister to Persia, Nasir-u-Din seemed to lend a willing ear to his advocacy of the development of commerce, the construction of roads and the abolition of various restrictions upon Persian merchants. In 1888 the Shah issued a proclamation assuring safety of life and property to all his subjects, and soon afterward declared the Karun River open to international navigation up to Ahwaz. In the same year the first railway in Persia was opened. In 1873 Baron Julius de Reuter had become the owner of a concession for the organization of a Persian state bank, with exclusive rights for the issuing of banknotes and also for the working of Persian mines. Russia then demanded what she considered a corresponding advantage but it was not until February of 1898 that Prince Dolgorouki, the Russian Minister, obtained from the Shah a document which gave to Russia the refusal of any railway concession in the country for five years.

The Persian state bank was established by the British royal charter of 1889 as the Imperial Bank of Persia. The Banque d'Escompte de Perse is — or was — a Russian government institution. Nasir-u-Din was assassinated in 1896 after nearly 50 years reign. His son Muzaffar-u-Din issued a decree on 5 Aug. 1906 convoking for the first time in Persian history a national assembly called the Mejliss. A constitution, dated 1 Jan. 1907, was confirmed on 11 February by Mohammed Ali Shah after his accession. The latter signed a new constitution in October limiting the sovereign's prerogatives and ecclesiastical authority and granting freedom of speech, press, conscience, of the person, etc. The duties of Parliament and responsibility of ministers were defined. This constitution was violated and abolished by the Shah in November 1908. Under British and Russian pressure he granted another constitution and signed a new electoral law in June 1909. He was deposed by the Nationalists in July and his son Ahmed Mirza, then 11 years old, was appointed Shah. The Mejliss was dissolved in December 1911 and did not meet again till 1915.

Anglo-Russian Intervention.— For a number of years Great Britain and Russia endeavored, unsuccessfully, to formulate a Persian policy which would make the most of those sporadic elements of progress still to be found in that ill-starred country and leave the nation to lead a quiet but independent life of its own. Though in apparent agreement as to intentions and aims, the British and Russian governments differed fundamentally about the means of achieving them, with the result that they were unable to accomplish anything useful. Each held considerable trade interests in Persia, while the chronic financial embarrassments of successive Persian governments made it necessary to raise foreign loans by mortgaging the customs receipts. Thus, in 1892, Persia contracted a 6 per cent loan of $2,500,000 from London; in 1897 various attempts were made to raise another foreign loan with the sole result of discrediting the Persian government in Europe. In 1900 Russia permitted the issue of a loan of $12,000,000 at 5 per cent, guaranteed by all the customs receipts of Persia excepting those of Fars and the Gulf ports. Russia gradually gained control of Persian finance and of the commerce of the northern portion of the country. British interests in Persia may be summed up in one word — India. The preservation of the Indian Empire had influenced the Asiatic policy of Great Britain since the Crimean War. That policy involved the maintenance of independent «buffer states,» e.g., Turkey, Persia and Afghanistan against the encroachments of Russia. Persian menaces against Afghanistan repeatedly caused strained relations with England in the first half of the 19th century. In 1856 the British invaded southern Persia as a protest against the Persian capture of Herat. The campaign was brief and the British troops never crossed the Southern Mountains. Persia sued for peace and evacuated Afghanistan. From this campaign dates the introduction of «khaki» (q.v.). In the Persian Gulf Great Britain has acted as «policeman» for over 300 years; in January 1622 British and Persians united in expelling the Portuguese from Hormuz, since when no foreign power has ever obtained a footing upon the Persian coast.

Under the Anglo-Russian treaty of 1907 the whole of northern Persia, to points as far south as Yezd and Ispahan, was declared to be within the Russian sphere of influence. The British sphere was defined as a triangle of southeastern Persia, the line being drawn from Bander Abbas through Kerman to Birjand and the Afghan frontier. The remainder of central and southern Persia, including the whole Persian coast of the Gulf, was declared to be a neutral sphere. Both governments engaged to respect the integrity and independence of Persia and to institute a control over the sources of revenue (within their respective spheres) in case of irregularities arising in the redemption or payment of interest on Persian loans. Persia became a party to this convention in 1912. After the fall of Mohammed Ali (1909) a regency was appointed and the Mejliss reassembled. Reform was a difficult task; the reformers were inexperienced and the treasury was empty. There was no organic bond between people and Parliament; many of the deputies were appointed by the government and the Mejliss itself nominated others. In 1911 Mr. W. Morgan Shuster, an American financial administrator selected by President Taft, was invited to Persia to take control of the finances. Mr. Shuster made a tactical mistake in refusing to recognize the Anglo-Russian agreement, by which he drew upon himself the inevitable hostility of Russia. A series of Russian interventions in questions of administration proved that that government interpreted its rights in a manner not consonant with the agreement. When Mr. Shuster chose Major Stokes, a British officer who spoke Persian, as commander of the gendarmerie to secure the collection of the taxes, the appointment was vetoed from Saint Petersburg on the ground that no Englishman could exercise authority in the Russian sphere. After eight months of uphill but fruitful effort, continually interrupted by friction with Russia, Mr. Shuster was dismissed by a Russian ultimatum, which was approved bv Sir Edward Grey. With regard to Great Britain, support of Russian claims in Persia was the price of the treaty of 1907, as support of French claims in Morocco was the price of the treaty in 1904. If those claims went further than was expected or approved by the British government, the European situation in 1912 rendered it difficult — if not impossible — to challenge them. After the departure of Mr. Shuster in January 1912 the country relapsed into hopeless anarchy. Russian troops were stationed in the north in various large towns for the maintenance of order and the protection of Russian interests. In the south, where disorder was more rife, Great Britain took very limited steps of a like character. Bands of brigands roamed the country attacking travelers and their escorts.

Persia and the War.— Though Persia remained neutral her territory was invaded near Mount Ararat where the frontiers of Russia, Turkey and Persia meet. (See WAR, EUROPEAN). In 1914 the British government advanced £50,000 ($250,000) and subscribed $11,000,000 to the share capital of the Anglo-Persian Oil Company. During 1915 German influences directed against Great Britain and Russia fomented disorders which led to the Persian gendarmerie revolting against the government and the murder of a British and a Russian vice-consul. A Russian force advanced upon Teheran to protect the legations. The gendarmerie was disbanded in 1916 and the Persian government accepted a British offer to place at their disposal a number of British officers to organize a new force. Within eight months Brig.-Gen. Sir Percy Sykes with three Indian officers had recruited an efficient force of 5,000 men and marched over 1,000 miles restoring order and suppressing bands of marauders. In January 1918 Persia asked Russia to withdraw her troops. Trotzky, the Bolshevist Foreign Minister, denounced the Anglo-Russian agreement. In May 1918 Persia informed Holland that she regarded that agreement and all other treaties imposed on Persia in recent years as null and void. To relieve distress and famine in Persia the American Committee for Armenian and Syrian Relief established a centre at Teheran and spent $2,000,000 during the famine in 1917–18. The young Shah expressed his gratification by subscribing $100,000 to the Fourth Liberty Loan, 3 Dec. 1918.

See BABYLON; CTESIPHON; CYRUS THE GREAT; DARIUS; KARUN RIVER; MANICHÆANS; MEDIA; NESTORIANISM; PERSEPOLIS; SUSA; TAB-

RIZ; TEHERAN; TIGRANES; ZOROASTER. Consult the works of Arrianus, Herodotus, Plutarch and Xenophon.

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PERSIA, ORDERS AND DECORATIONS. See ORDERS, ROYAL, AND DECORATIONS OF HONOR.

PERSIAN ART. One may assume, for the purpose of easier classification, two main subdivisions of Persian art, viz., the early period ending with the Mohammedan conquest of the country, and the period beginning with the latter point and ending with the present. And in the term “art” it is well to include not only architecture and sculpture, but all forms of painting and artcraft which exemplify and illustrate so large a portion of the Persian artistic genius as well. Doubtless Persian art received its first stimulus from Babylonian sources, filtering in by way of Sogdiana (Susiana). But very little is known about this for certain. There are, to be sure, a few references, or which seemingly purport to be such, to such a process in the early Sacred Scriptures of the Persians, but those are not plain in their meaning, cite no details and give no dates at all. So much, however, has been ascertained that no vestige of any prehistoric or very early Iranian art has survived. This indeed is no wonder when we keep in mind what has of late years been established irrefragably, namely, that the very beginnings of Persia do not go back farther than the immigration era, lasting probably for many centuries, when hordes of adventurous tribes (the forefathers of the Persians), many of them nomads and on a low plane of development, crossed over into the Iranian Plateau from India, coming in shoals large and small and settling on their new-found lands. This process of gradual immigration must have antedated, of course, an autochthonous civilization of their own. The so-called Median period (B.C. 700–550) is the most ancient we can deal with definitely as to a Persian art life. But the records are rather meagre. It is true we read of the architectural wonder of the royal palace at Ecbatana, the Hamadan of our day, but Herodotus, our authority, tells only of what he has heard and not of what he has himself seen. And his descriptions are rather vague. Polybius later on speaks glowingly of the «gold-plated edifices» at Anatis, the city named after the Persian river goddess, and furnishes some details, such as the «silver roof tiles.» These Greek accounts all refer to several centuries before Alexander the Great overthrew and trampled under foot the Persian Empire, and Ecbatana was the capital of the Median state. When Persia fell and crumbled at Issus and Granicus, untold artistic treasures in precious metals were carried off by the plundering soldiery, spoil from the outside and inside of the royal palaces and temples. But that the style of architecture exhibited by the early Medians and Persians was stiff and somewhat conventional, consisting mainly in foundations of enormous platforms or terraces, upon which were reared the buildings themselves, seems certain. Not only that, but the Medians and after them still more the Persian architects borrowed all around from their neighbors to produce effects, from the Egyptians most, from the Assyrians, the Lydians and others. Most prominent of the remains of Persian art that have come down to us are the tombs of the kings belonging to the great Achæmenid dynasty. The tomb of Cyrus in Pasargadæ reveals Hellenistic influences, but the others are different. Cubic masses of rock are surmounted by a flattened pyramid, with little of ornamentation. Egyptian models evidently inspired the forms of these tombs. The tomb of Darius in Persepolis is, however, carved into the living rock itself. Egyptian *motifs*, too, governed in the erection of the palace of Darius — the same doors and gates, the same architraves and cornices as in the pharaonic ruins of Memphis. In front of the wide entrance ascends a terrace of 1,100 steps, leading direct to the throne hall, and further on is the hall of Darius with its 100 pillars. The palaces of Susa and Ecbatana are built on the same general plan. And the architectural skill displayed by the Arsacids, as shown by the remains of the great palace of Servistan, leaned still more on Egyptian models. What is left of the Sassanide palace at Ctesiphon, erected by Chosroes I, exhibits Coptic influences. The ruin shows a nave 80 feet long and 150 feet deep, covered by an elliptic cupola 110 feet high. It is everywhere observable that the Persians, while borrowing freely in spirit and form of architectural plans from foreign nations, made the highly original interior decorations chiefly their own concern. The columns supporting the audience hall of Darius, for instance, are irreproachable with their elegant shape and just proportions, the capitals showing bullsheads of fine design, and exquisite enameled brick and wonderful bas-reliefs everywhere apparent. However, the open-air lofty structures of the Persians, the large and well-lit halls, such as we see in the ruins of Persepolis and Pasargadæ, are admirably adapted to the climate and to their uses, and one feature especially, the delicately tinted and very durable tiles, is noted thus early. Sculpture, both in bronze and hard stone, is massive, somewhat uncouth, though possessing rugged strength. But it is rather monotonous; the groups of combat showing the slayer of lions and bulls as a victor,— nearly always typifying a ruler or a god,— recur too frequently. When Persia was at its zenith, the time of Darius, enameled bricks of cement, with relief pictures in brilliant colors, pillars (some of them graceful and slender, suggested by the palm tree, such as the one left in a ruined temple near Kermanshah) with voluted capitals in three rising sections, were much used in the palaces and sacrificial buildings. Then there was a rapid and steady decline, all through the Parthian and Sassanide period, with occasional Hellenistic or Arabic influences apparent. No specific style of art is seen till after the Moslem conquest. And the bastard Greek art flourishing along the shores of the Black Sea is often noticeable during these first centuries of the Christian era. So, too, in the specimens of the coiner's, the gold and silversmith's skill that have survived. Sculpture died with the Arab invasion of the 7th century, in consonance with the Koranic injunction. Not so, however, the art of painting in all its branches. On the whole, architecture in Persia has made no strides forward during the last 1,000 years. On the contrary, nothing of equal value has taken the place of the stately piles of ancient times. Private buildings while generally of rather graceful outlines are made of cheap and flimsy material, even the Shah's palaces, villas and shooting boxes being no exception. For the style of the mosques and *medressehs* the Arabs stood sponsor, although there is an occasional exception, such as the famous mosque at Koum, with its bronze cupola. On the other hand, despite Mohammed's prohibition of representing the human figure, painting has progressed greatly in Persia since the adoption of Islam. Her artists for many centuries past have excelled particularly in the field of miniature painting, in all its branches. Some really good specimens of portraiture may still be seen in the Shah's extensive palaces and pavilions in Teheran and in some of the houses of wealthy Persians. But as battle painters, as painters of harem and family life, as decorators of costly furniture, and above all as illuminators of manuscripts the Persians have accomplished considerable. Much of this work is covered with a thin lacquer coating to withstand wear, and the mingling of colors is nearly always highly harmonious and yet original. Illuminating manuscripts, outdoing the achievements of our own mediæval monks, are still being produced in every art centre of Persia, such as Ispahan, Tabriz, Teheran, Shiraz, Hamadan, etc., that vie with the best. But this style of art is of relatively recent growth, for scarcely anything remarkable exists much antedating 1400. Bihzâd (who flourished at the Saffanide court, 1460–1525) was the greatest of these painters. One very peculiar feature of this style of art is its minute faithfulness to life, its realism, the microscope being often required to discern its details. Mikrâk, some time later, who did most of his work in Bokhara, was pastmaster with a peculiarly florid brush. Under Shah Abbas the Great and Nadir Shah, two conquering rulers with open purses, there was a whole school of highly efficient artists of this type. Many illuminated manuscripts brought rewards of between $2,000 and $10,000 from the royal treasury. Of battle paintings, done in the miniature manner, there are still some veritable masterpieces extant and in good condition. The greatest battle painter of Persia, Ali Kûli Begh, thus glorified the reign and the victorious campaigns of his patron, Abbas the Great, who about 1600 invaded India. From the time of Nadir Shah, 150 years later, there is yet in existence a fine battle picture, less than a foot square, but on which not less than 1,200 human figures are distinctly portrayed, some of them plainly showing, though in microscopic dimensions, the passions that tore the combatants. The king himself, on a white charger, is seen with his viziers and a group of warriors surrounding him, while in the distance the fight still rages.

Included must be also artcraft, such as ceramics, rug weaving, decorations of arms, etc., in all of which Persia has achieved much for ages. The silken rugs of Persia still lead. The choicest of these dainty rugs come from Feraghân, Kermân, Shirâz and Khorassân. Their soft colors blend marvelously. One priceless prayer rug in Shah Nasr ed-Deen's treasury is said to be 650 years old and of indescribable charm. A brief *sura* of the Koran was woven into the texture in thin gold thread, and Allah's throne above it, with turquoise and rare rubies encrusting it. Besides these art rugs, serving for ornament or wall decoration mostly, the woolen and felt rugs of Persia, some of them heavy and very durable, and often of wondrous design, must be mentioned. Finely tempered steel weapons and artistic metal work of every kind, hammered ware, scimitars, bucklers, scale armor and net cuirasses, etc., are also a Persian specialty. Threaded and inlaid work, often showing floral designs of rare beauty, wrought in bullion, and set in precious stones, the whole embellishing mirror frames, wall cupboards, tiny tables, etc., and carved and grilled work in sandal, teak, cedar, camphor wood, likewise bear testimony to the innate art spirit of Persia. Though with the invasion, in 1722, of the Afghans under Ameer Mahmoud, the secret of the manufacture of the peculiar Persian tinted and glazed pottery and «fayences,» even of the marvelous tilings, made up to that period, seems to have been lost forever, there is a good deal of this artistic ware still in the country. Some of the mosques in Persia are coated on the outside with these wondrous tiles, the latter being of a delicate blue, brilliant black or soft pink hue. The making of fine glazed pottery and chinaware was learned directly from the Chinese, and from the 13th to the 18th century the industry flourished in Persia. A delicate apple green found on many of the old Persian pieces can only be duplicated by the rarest of old china pieces.

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PERSIAN GULF, sometimes called an arm of the Indian Ocean, 520 miles long, 150 to 200 miles wide, with an area of 95,000 square miles, and a depth rarely exceeding 170 feet, and varying so slightly as to make navigation remarkably safe. The Strait of Ormuz, 30 to 60 miles wide connects it with the Gulf of Oman, which opens directly from the Arabian Sea. The entire gulf is the product of the same geological force which traced the course of the Tigris and of the Euphrates. The coasts are calcareous, flat and sandy on the Arabian side and high and sheer on the Persian side. Among the islands of the Gulf are Ormaza, Kishm and the Bahrien group, the last being an early home of Chaldæan civilization, one of the traditional sources of the Phœnicians and the source of important pearl fisheries. The fauna contains some peculiar specimens; tiny sea-animals give the water not only a phosphorescent hue, but so green a tinge that the Arabs called it the Green Sea. Its economic importance is due to the excellent fishing, notably for pearl-oysters, which are annually worth about $2,500,000 and employ 70,000 fishermen and 6,000 barks. Great Britain practically controls the Gulf. Russian influence in Persia is often reckoned as aiming at the concession of a port there to be reached by a railroad line from the Trans-Caspian province.

PERSIAN LANGUAGE. Just as Persian literature, in the narrower and stricter sense, so also the Persian language is only about a thousand years old, although it must be admitted that the difference between the modern tongue and that spoken say some 2,000 years ago by the ancient Persians is scarcely as great as is, for instance, that between the French, German or English of the earlier Middle Ages and that of to-day. (See also Iranian Languages). Essentially modern Persian is the slow outgrowth of the stately and sonorous idiom of the Avesta or the Gâthas, the Zend, but in the sloughing process has lost much of its one-time majesty and beauty, though on the other hand it has enormously enriched itself by adopting throngs of foreign words (mostly Arabic and Turkish), until it is more fit to express every mood and even the most delicate shade of an idea than is any other Oriental language. During the more than three centuries that Persia dumbly had lain under the heel of the Arab conqueror every vestige almost of national Persian thought had been stamped out, the very vernacular of the humbled people tabooed, and when finally Persia once more arose, a new idiom rose with it from the womb of obscurity. The mentality, too, of the nation had been changed. Islam with its wholly different code had powerfully impressed itself on mind and morals of the new Persians, and the new speech faithfully mirrored these marked alterations. The present cultivated form of Persian is called *deri* by the Persians themselves; it is a «court language,» in distinction from the popular dialects, which latter have withstood, throughout all the political vicissitudes, the insidious influence of court favor much better. Each province of Persia has a dialect of its own, those of Shirâz and Ispahân approximating most nearly with *deri*, while those spoken on the shores of the Caspian, in the provinces of Masanderân and Ghilân resemble most of the ancient speech. East of them, in Khorassân, Persian is spoken in the towns, a mixture of Tartar and Turkish outside of them by the nomads of the steppe and the agricultural population. Elsewhere the matter is treated with some more detail.

With the new religion the Persians also adopted the Arabic aphabet (*talik*), at least in the main. The cuneiform system of writing being wholly discarded and buried, the new one was a syllabic system, marking out the consonants, at least in most cases, possessing no special characters for the vowels. To the 28 Arabic consonantal signs were added four specific Persian ones, the *p, tch, sh* and *g*, while nine of the Arabic characters were dropped as useless. Thus, then, we find five vowels in modern Persian: *a, e, i, o, u*. But the manner of enunciating them differs greatly, not only as to provinces but as to individuals. These vowels when written at all are written in the queer Semitic fashion, sharing among them only three characters, and are mostly omitted in the writing when short. Of consonants there are the gutturals *q, g, gh, k, kh*, the latter almost identical with the Welsh sign and all of them rather harsh. Then there are the palatals, *tch* and *j*; the dentals, *t, d, n*; the labials, *p, f, b, m*; the semi-vowels, *y, r, l, v*; the sibilants, *s, sh, z, zh*; and the aspirated *h*. The sounds thus produced tally in the main with those of the Huzvaresh, but have lost several aspirates and have added the *l*. As to the inflection of nouns and adjectives the modern Persian has been entirely deprived of it, whereas in Zend and in Old Persian these forms were rich and expressive. The whole grammar, in fact, has become greatly simplified and reduced almost beyond reasonable bounds. Having absolutely no gender in its extremely bald grammar, Persian cannot give the equivalent of «he,» «she,» «it,» but helps itself by employing separate words conveying the meaning of sex. There are two endings for the plural, *hâ* and *an*, the latter being restricted to animate objects. The suffix *râ* is used in lieu of the accusative, originally meaning «through,» «by means of.» The vowel *i*, the so-called *izafet*, is made to do the duty for a variety of purposes. It is really the remnant of the relative pronoun *ya*. Standing between the noun and its qualifiers, it indicates possession, relation, means. The long vowel *ê* is employed, attached to a noun, to indicate aloofness, rarity, singularity, oneness; as merd-*ê*, a single, lonely man. This *ê* is what is left of the Zend *aêva*, meaning «one.» There is neither definite nor indefinite article in modern Persian. The pronouns are of pure Iranian stock. In the latter idioms we see an abundance of suffix pronouns, singular and plural: *em, et, esh, emân, etân, eshân*, and these are added mostly to verbs and nouns, serving the purpose of marking the otherwise lacking cases. The passive voice of the verb is constructed by the use of the auxiliary *shûdan* (to go). The future is formed by prefixing to the shortened infinitive the present tense of *gâhen kerd:* to wish, to will, to be about; and the imperative of this verb is *kûn*. As regards the irregular verbs, which are both abundant and of most frequent and necessary use, they vary both from the regular form of the infinitive and imperative. The tenses of the indicative are the preterit, the imperfect (by giving the preterit the prefix *mî* or *hamî*), the indefinite present or aorist, the true present (made by giving the prefix *mî* or *hamî* to the aorist), and the future, marked by the prefix *bi*. The comparison of the adjective is made by adding *tar* for the comparative and *tarîn* for the superlative. The manner of stating a fact or conveying an idea in Persia differs as a rule somewhat from the Western fashion, in fact from the mode in vogue in all European tongues. Thus, to say «my father,» the Persian puts it «*pidar hya manâ*,» i.e., literally, «father that of me.» In his whole speech as in his thinking he, too, abhors a naked fact. One can never pin him down to exact figures, for instance; his way is then to use some such phrase as «more than man can count,» «like the sand by the seashore.» But here we touch on psychology. Persian has developed away from the original mother tongue or root, the Sanskrit, by substituting the letter *h* for the Sanskrit *s*, as shown in the word *sindhu* (Indian and Indus) to *hindu* (Zend); *hindu* (Old Persian), and *hind* (Modern Persian), and in many others. The original aspirates *gh, dh, bh*, became *g, d, b*; as in Sanskrit *bhumi* (earth) to *bûmi* (Zend), *bûmi* (Old Persian) and *bûm* (Modern Persian). Again the letters *k, t, p* change into *kh, th, f* before consonants, and the hard sibilant *s* of the Sanskrit becomes the soft sibilant *z* in Persian; as in *Asurô Medhâs*, to *Ahurô Mazdêo, Aura Mazda, Ormuzd*. There was a lapse of fully five centuries, the time when Alexander the Great destroyed the Persian Empire until the rebirth of the country under the national Sassanide dynasty, A.D. 220, when there reigned a complete dearth of literary production. Not a line, not a word has come down to us from this long Arsacide period, and even the Persian coins preserved were Greek in workmanship and in imprint. But Persia after this long lapse was still Persia. And when Persia awoke once again from its second dreamless slumber of three centuries' duration, a sleep in which it had been prostrate under the heel of its Arab and Moslem lords the same uncanny fact strikes us once more. The tongue of Persia has survived. What the great Firdûsi uses as the vehicle of expression in the «Shah Namêh» is again veritable Persian with an astonishingly small infusion of Arabic, circumstances considered. It is nearly a pure Iranian dialect he employs; so does the Persian translation of Tabâri's «Chronicles.» But from the death of Firdûsi (A.D. 1020) on without any tyrannical pressure whatever from above the Persian writers became more and more negligent in this respect. The number of Arabic first and of Turkish words next which are paraded by them in the guise of acquisitions to the Persian language grows steadily. Scientific works not alone are composed in Arabic then and after, but literary works teem with Semitic or Turanian vocables. It would seem that Persian writers for a long time took a pride in turning out works in such bastard Persian, and not writers alone — courtiers, officials, rulers, even priests, out of sheer pedantry and affectedness employed it, so that half the words used were often of foreign origin. And this tendency, sad to say, has continued uninterruptedly for nearly a thousand years; it is deplorable from a philological point of view, since Persian is by rights one of the richest and most flexible, sonorous and elegant idioms in existence, one which could afford to stand altogether on its own bottom. The ease with which Persian lends itself to composition of every type is very great, owing to the latitude given the writer in forming new compounds, often very bold experiments, such as epithets made up of compound adjectives and nouns, of two nouns, of nouns and verbs, of verbal phrases, of nouns and prepositions. Quite characteristic, too, is the manner in which a compound or derivative verb is combined with an adjective or noun, or else with one of the large number of semi-auxiliaries, such as «to do,» «to make,» «to bring,» «to have,» «to show, «to come,» «to take,» etc. But Persia, though politically it has declined for the space of several centuries, has in its language a treasure which will not stay buried. The opulence and inexhaustible resources of it await merely the hand of another genius, like one of the past, to give the language a second golden age.

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PERSIAN LITERATURE. Of ancient Persian literature only fragments of a religious character are left. Persian literature in the stricter sense takes its rise shortly after the settlement of the Arab conquerors, after the utter downfall of the Sassanides and the forcible conversion of the Persians to Mohammedanism; that means, therefore, since the growth of the modern Persian language. To judge correctly the importance of Persian literature proper it must be borne in mind that it was very largely instrumental in building up once again the entire Persian race; that its spread was more than commensurate with the spread of the Persian language itself to far beyond its proper boundaries, all over India, in fact, where for a number of centuries it was one of its chief centres and attained to great lustre; that of all modern Oriental literature it is by far the most comprehensive and varied, the most elegant and refined and that — just to cite but one case of its pervasive influence — the thoughtful, gracious verse of the «tentmaker,» Omar Khayyam, in Fitzgerald's translation (undoubtedly an improvement on the original) has become almost a sort of literary vademecum with the intellectual elect of every western nation. The subtle charm of Persian literature even drew the Tartar and Mongolian hordes into its net. Only in drama it is weak and negligible. The passion play, or *tazieh,* as regularly performed in the Persia of our days in each Muharrem, the month of mourning for the slaughter of Hussein, is more like our mediæval mystery plays; it glorifies the rise of the Shiah split within Islam and is scarcely to be accounted a literary factor. Of late years, though, there has been noticed a widening of the scope in drama. But with that exception, albeit a telling one, Persian literature is singularly copious, all-embracing and vivid, cultivating every branch and every style of writing, from the most courtly, grave and dignified to the most debonnair, scurrilous or spirited. One other peculiarity must be noted. Persian literature is also the fountain head of Soofeeism — that deep-tinged scepticism which even to-day pervades the mind of the educated classes of Persia. The sketch here given cannot, of course, make pretension to completeness. It can merely outline the vast field. Persian literature excels in poetry, the graceful idiom and its vast vocabulary adapting itself admirably to it. A tradition more or less leaning on fact relates how as early as the time of Bahrâm Gôr (A.D. 420–438), that prince invented the art of versification. Aufi, in his work on literary history, about 1180, even quotes a few rhymed lines of this crowned poet, who is answered in kind, on the spur of the moment, by his beloved slave, Dilârâm, she employing the same metre and syllabification. During the reign of another Sassanide, Chosroes Pahrwis, there certainly lived a poet, Barbêd. And it seems quite certain that even during the dark days of Arab Moslem rule that followed the total destruction of the Sassanides and of Persian national life and institutions there lingered on in the soul of the Persian people the love of poetry, of legendary and national epic lore. But only after the dissension growing out of the warring claims to the caliphate and the rise of Sheeism in Persia and thus of a rebirth of nationalism, modern Persian poetry sprang into full light. The Tahiridas, Saffarides and Samanides, short-lived reigning houses, A.D. 819–999, assisted and cherished this movement. Next, the Ghaznavis (from 976 on) and the Seldjuks (after 1037) as well as even the rude and untutored Tartar and Mongolian chieftains under Genghis Khan and his successors, who overran and ruled all the Iranian plateau, did much in the same line. In fact, Persian literature for the space of four centuries, i.e., during the period of its greatest splendor, owed much to the favor of rulers and courts. This favor, too, was responsible for an entire school of Persian poets — the panegyrists one might call them. The first period, however, that of about 900–1100, gave fruition to the purest and most characteristic Persian heroic poetry. There is first, the great Rûdaki (d. about 950), the author of 100 volumes of poems, of which, though, but little has come down to us. Some 50 of his lays only have been printed in their original text and a translation. Kaboûs, a ruler of Ghilân, with his book in 44 chapters, the ‘Kaboûs Nameh,’ gave a standard work on princely manners and virtues still acknowledged throughout the Orient as a model. At the court of the great Mahmoud Ghaznavi (998–1030) poets and savants were assembled and flourished in the sunlight of his favor. It was due to his inspiration and encouragement that a cycle of epics arose, based on ancient Persian traditions and myths. His poet laureate, Unszûri, wrote the heroic tale of ‘Wâmik i Asrâ.’ His pupils, Farrûkhi and Dakiki, wrote in a similar strain. But outshining them all is Firdûsi, the ‘Homer of the Orient,’ the author of the ‘Shah Nameh’ (Book of Kings), in which breathes the pure national spirit of ancient, proud Persia. Indeed, in the ‘Shah Nameh,’ legend and historic truth are mingled in such masterly fashion that these elements become welded into a splendid homogeneous whole and to the Persian mind at least leave no doubts. Following in the same path, other legendary epics were written by Firdûsi's imitators, such as the ‘Djehân Gir Nameh,’ the ‘Barzû Nameh,’ the ‘Gershasp Nameh,’ etc. Sheikh Abu Saïd (968–1049) wrote spirited quatrains, and Nasr-i-Chosroes (1004–1088) didactic poems showing both depth of thought and high moral aspirations. Tabâri's work was issued in the revised and embellished chronicles of Bal'ami, and Menô-Chehri likewise belongs to this category. During this entire period the ferment of national enthusiasm never flags. But with the next, the 12th century, there is a distinct change in all this. Both panegyrists and fiction writers monopolize the stage. Enveri (d. 1191) was the ablest and subtlest of those court scribes who glorified the barbarian despots or for that matter, any rulers possessed of fat purses, as in their writings they themselves shamelessly admitted. But though Enveri led the list, there were many like him during the period of about 1100–1300, such as Zenâyi, Reshid ed-Deen (1247), Wassâf, Shereef ed-Deen, the historian and apologist of Tamerlane and Châkâni Hakâiki. Again, always an important branch of Persian literature, the entertaining or amusing stories, anecdotes, legendary and supernatural tales crowded the pages of the Persian writers of those days. Some of these, like a Persian paraphrase of the fables of Bidpay, Turâmi's ‘Nigaristân’ (Picture Gallery), the ‘Bakhtyâr Nameh,’ ‘Tuti Nameh,’ etc., enjoy wide popularity even to-day. Among the earliest Soofees turning up at this time, Sanâi (d. 1131) is noticeable, with his mystical ‘Garden of Truth.’ The antithesis to him is Omar Khayyam, the satiric freethinker and charming cynic. Reshid Watwât (d. 1182) writes a compendium of poetical rules. The greatest name, though, during this period is that of Nisâmi, the Boccaccio of Persia, whose love stories are so true to nature and their plots so plausible and well-constructed that they charm the reader even to-day, notwithstanding that the Persian “ishk” and the English “love” are by no means convertible terms. The next, the third period of Persian literature, a period synchronizing with the frightful devastation wrought in the whole land by Genghis Khan and his Mongolians, is, nevertheless, the golden age of Persian letters. The three great stars shining in her literary firmament were Sa'adi, Djelal ed-Deen Rûmi, and Ferid ed-Deen Attar. The last-named as the guiding spirit of Persian mysticism. His chief writing, ‘Esrâr Nameh’ (Book of Mysteries), ‘Pend Nameh’ (Book of Counsel), and ‘Djevahû Nameh’ (Essence of Substance) are deeply tinged with Oriental mysticism and not to be appraised at their value without possessing the key, being replete with allusions incomprehensible to the uninitiated. He lived to over 100 and then was slain by the conquering Mongolians during the sack of the city in which he dwelt. Djelal ed-Deen Rûmi was the great founder and the intellectual centre of that Moslem pantheism which even to-day runs through the whole Orient, often side by side with occasional flashes of fierce fanaticism and narrow bigotry, and his writings breathe the spirit of Soofeeism throughout. But to the Western world Sa'adi has always seemed greater and closer and more rational as a thinker. In his ‘Gulistân’ and ‘Bostân,’ his two chief books, there is a pleasant simplicity of fable and diction, coupled with a sound sapiency that are touching. Sa'adi, too, passed the ordinary span of life allotted to man, and is said to have died at the more than venerable age of 120. His Persian biographers usually divide his life into periods of 30 years, he devoting himself to philosophic travel from 60 to 90, and the last space of equal length to writing down his manifold experience. This, however, is probably one of those flowery inaccuracies of the Oriental mind with which we are constantly struck when sounding it. It is true, however, that Sa'adi's life was long and full of vicissitudes, he being, among other things, a prisoner of the Crusaders for years; that he wandered far and wide and often knew hunger and thirst, and that he did his writing in his very old age.

The period of 1300–1400 was, in one respect at least, the most brilliant for Persian letters. It is curious to note that it was precisely during this time, the time when the whole Iranian world was groaning under the Mongolian yoke and politically in the very depths of abasement, that Persia reached her literary zenith, certainly in the field of lyrics. Her greatest poet, one who as yet is quite insufficiently appreciated in the West (owing, doubtless, in part to inadequate translation), Hafiz, that is, sang his sweetest and gayest. Tuneful and multicolored they are, his lyrics, covering an immense range of human emotions, though with «love, roses and wine» predominating. Hafiz by common consent figures among the few greatest lyrical poets of all ages and climes. His finished, smooth and easy verse, attuned to every known measure and mood, has since served the whole Orient as an unapproached model. Wassâf and Kâsim-i-Anwâr are likewise to be mentioned. The succeeding century showed the poetical genius of the Persian people at a standstill. It is altogether dominated by the surpassing gifts of Djâmi, the last of Persian poets of the first order. His achievements were assuredly most comprehensive, since they partook of epical, lyrical and mystical literature. He exceeded his immediate forerunners in all these, and he brought the form at least to absolute perfection, his style being throughout most brilliant. But Djâmi was as certainly deficient in creative powers And after his death, from 1500 on, begins the slow decline of Persian letters. Djâmi's imitators, his son-in-law Hâtifi, Hilâli, Ali of Shiraz, Feisi and Fettâhi, did some clever work, although lacking in initiative. Since 1600 of the men of letters writing in the Persian vernacular, either in Persia or India, who stand out above the average may be cited, among the lyric poets: Tâlib, Sâib, the Emperor Shah-Alâm and Aftâb, the latter's teacher. One leading feature of this later period is the extraordinary wealth in prose fiction, especially collections of fables, fairy and mythical tales, novels and short stories. Most of these had their first home in India and traveled thence, first to the Persians and next to the Arabs, Turks and Koords, whence they finally reached the Occident in versions more or less garbled or emasculated. The collection of fables, published by Hussein Wâïs Kâshifi under the name of 'Enwâr-i-Suheîli,' belongs in this category. So do the bright fairy stories of Nakhshebi, as well as 'Behâr-i-Danish,' by Inayet Oullâh; the novels of Hâtim Tâï, and the great cycle of novels, 'Bostân-i-Khayâl, in 15 huge tomes. During the 18th century again Ferid Ghafr Khan transcribed the fanciful folklore tales of Hâtim ben Obaïd. Another sphere in which Persian literature excels is history. These writings deal in part with the Mohammedan states in general, but likewise with biography, special history and monographs. The habit of using Arabic exclusively as the vehicle of expression when dealing with scientific topics, a habit adopted since the first coming of the Moslem Arab conquerors of Persia, hampered Persian historians for a long time, for many centuries in fact. The first break with this iron-clad custom was made at the instance of Mansûr ben Nuh, in causing a translation of Tabâri's great Arabic work to be made by Bâl'ami, in 963. An excellent work by the famous vizier, Nisâm-ul-Mulk, the 'Siyâset Nameh,' dates from about 1092. Minhâdj ben Sirâdj wrote a huge general history, embracing the time up to 1259, and entitled 'Tabakât-i-Nâssiri,' while Hamdullâh Mustâfi wrote one in 1329 under the title of 'Tarish-i-Guzide.' Reshid ed-Deen of Hamadan published a history of the Mongolian conquerors, the 'Djâmi Uttawârish.' The chronicles of Wassâf also deserve mention, notably because of their florid and highly polished diction. The 'Zafâr Nameh,' being a history of Tamerlane; the 'Rauset Ussefâ,' a universal history couched in rhetorical phrase; the 'Habib Ussiyar' by Khondemir and 'Lûbbuttawârish' by the Ameer Yahia may be named. By the official adoption of the Persian idiom at the courts of the new-established Moslem dynasties in India and of the entire ruling class there, it came about that up to the very conquest of that vast country by the British most, in fact nearly all, historical writing was done there in Persian. Elliott's famous 'History of India as told by its own Historians,' continued by Dawson, gives in a faithful English translation a very good summary of all this. And it is but proper to add here that all these so-called historical works in the Persian tongue are properly classed with literature. For while as a rule they plainly show the defect of the Oriental mind, its horror almost of absolute, bald truth, they give free reign to Oriental imagination and generally welter in poetical description, beautiful pageantry and in admirable strokes of fancy.

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PERSIAN MYTHOLOGY. A large number of the Persian myths agree with the earlier and earliest Indian ones and are doubtless drawn from the same prehistoric sources, dating back probably to the days before B.C. 4000. We find in this list the tale of a great ceaseless battle between the Sun God (*Trita, Indra,* Iran. *Thraetona*) and a colossal, evil serpent (Ind. *Ahi,* Ir. *Azhi*), a myth embodied and reclothed by Zoroaster in his self-evolved creed. There is also the legend of *Yama,* the first man, now ruler of the dark regions after death; of the «Glorious One» (Iran., *Huzrava, Chosrau, Chosroes*), the performer of great and useful deeds of valor, a sort of Persian Herakles; of the highest god, the All-Ruler, *Asûra; of Mithras,* of the Dragon-Slayer, *Verethraghna.* These earliest mystic and symbolical tales were common to both branches of the Aryan stock, the Indians and Iranians, and have survived all religious and political changes that have occurred in Iran; and so have, up to the Moslem conquest, the fire cult, the veneration of the sacrificial flame, the belief in *soma,* that lifts up man to the gods and fills him with divine strength and fevor; the command to conceive pure thoughts and do good deeds; the faith in the efficacy of prayer, incantations, magical power with certain secret formulas, the *manthra* of the early Persians; the submission to fate by gods and men; the service of the *athravan,* priests, mediators, nursers of the flame. All these things have come down from primeval days. But there are unexplained features in all this. No written records tell us of it, but there must have been a long and bitter strife between the two branches — the Iranians and Indians. Only thus can be understood the fact that the old and mutually recognized gods, the *daeva,* became in later days in Iranian eyes «demons» and «evilworkers,» while the Indians retained them as beneficent superhuman beings, and that the Iranians called their own gods instead *bhaga.* And that, on the other hand, the Indians dethroned the highest god of the Iranians, *Asûra,* and his subservient helpers, and degraded them to the level of evil spirits and devils. There is, too, at a very early date, plainly perceptible a schism between the two subdivisions north and south of the Indus. Persians, though fanciful yet deep thinkers, were throughout a virile people, bent on practical purposes and enjoying the good things of this earth, while the Indians even in prehistoric times, even before the appearance of their oldest holy books, lapsed into dreamers; their pantheism became negative, even denied the use and purpose of sublunar life itself. Probably climate had much to do with this. In any case this striking contrast must have separated the two races very early and accounts in large measure for the phenomenon of their respective historical development. However, the cycle of myths above referred to, the joint parent possession of the Aryan race, remained firmly fixed in the Persian soul. Zoroaster in molding anew the Persian creed into a purer and more rational one, was a skilful adapter. He retained in somewhat altered shape the ancient sagas and heroes. So did Firdûsi in his legendary history «Shah Nameh,» even adding to the list some names that had acquired fame as purely Persian doers of great things, such as Rustem particularly. And the Persians of today still bear these early seeds of faith, this pristine philosophy, in every fibre. Their early mythology breathes in their wonder and fairy tales and in their outlook on spiritual life. Firdûsi's stories of the beginnings of the Persian state, though presented with a naïve appearance of truth, are wholly unwarranted, however. He tells of the overthrow of a mythical personage, King Afrasiab, by the national hero, Rustem. As a matter of fact, though, history in Persia started with their migration from India.

Consult Geiger, L., ‘Ostiranische Kultur’ (Erlangen 1882); Hübschmann, J. H., ‘Iranische Studien’ (in Kuhn's *Zeitschrift fur vergl. Sprachforschung,* XXIV, pp. 323–415, Berlin 1879); Spiegel, F., ‘Eranische Altartumskunde’ (3 vols., Leipzig 1871–78).

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PERSIAN POWDER. See Insecticides.

PERSIAN WHEEL. See Noria.

PERSIGNY, pĕr-sēn-yē, **Jean Gilbert Victor Fialin,** Duc de, French statesman: b. Saint-Germain-l'Espinasse, department of the Loire, 11 Jan. 1808; d. Nice, 13 Jan. 1872. Having entered the cavalry division of the army he took part in a movement among a section of the troops in favor of the revolution of July (1830) and was expelled from the service on the charge of insubordination. He then went to Paris and took up journalism, became an intimate friend of Louis Napoleon, and an active disseminator of Bonapartist propaganda. He was the instigator of the military rising at Strassburg in 1836, was arrested, but managed to escape; and in 1840 shared in the expedition to Boulogne, when he was again captured; and on this occasion condemned to 20 years' confinement, but his captivity ultimately resulted in little more than restriction to the town of Versailles. During this period he wrote and published ‘Memoire de l'Utilité des Pyramides de l'Egypte’ (1845). On the outbreak of the revolution of February 1848 he hastened to Paris, brought about an agreement between the members of the Napoleon family, collected their adherents, traveled over France on their behalf and in various other ways largely contributed to determine the vote by which Louis Napoleon was elected President of the republic, on 10 Dec. 1849. He was also one of the most prominent actors in the *coup d'état* of 2 Dec. 1851. In January 1852 he was nominated Minister of the Interior, and in this capacity signed the decrees relative to the confiscation of the Orleans estates, and directing the first elections to the *corps législatif.* In 1855 he went as Ambassador to London. In 1860 he was again made Minister of the Interior, but in 1863 was compelled to resign because of his attempted arbitrary control of the press. He was elevated to the rank of duke in 1863, and thereafter held the position of Senator until the fall of the empire. Consult d'Espagny, Count, ‘Memoires du Duc de Persigny’ (Paris 1896); Delarva, ‘Le Duc de Persigny et les Doctrines de l'Empire’ (1865).

PERSIMMON, or DATE-PLUM. These names are given to each of several trees and shrubs of the family *Ebenaceæ.* Like other members of their genus (*Diospyros*), of which there are about 200 mostly tropical species, these have deciduous or persistent entire leaves, diœcious or polygamous, whitish or yellowish flowers in axillary cymes, followed by large juicy fruits (berries) containing from one to 10 flat seeds. The best known species in America is the common or American persimmon (*D. virginiana*), which often reaches 50 feet in height and sometimes 100 feet, with a spreading, round-topped head and frequently drooping branches. It is found from Connecticut to Indiana and southward to the Gulf States. The plum-like fruits, to which the calyx is adherent, are usually about an inch in diameter, yellow with a pink cheek on the sunny side, and of variable flavor. Contrary to popular belief, they are not always astringent until frozen, nor does freezing make all persimmons edible. There are wild varieties which ripen in early autumn before frost, and others which continue unpalatable in spite of frost and sun. The tree will thrive as far north as southern Michigan and western New York. Though there are numerous native seedlings which bear good fruit, yet even in its most favored districts the tree has attracted little horticultural attention. Like other members of the genus, notably *D. ebenum*, which yields ebony, this species furnishes a hardwood useful for interior finish of houses, but ill adapted to resist moisture. Propagation is readily effected by means of seeds stratified out of doors during the winter and planted like peach-pits in the spring. Since they are exceedingly variable, they are usually grafted or budded when two years old, in early spring, with desirable varieties. Unless transplanted when very small, they are likely to fail because of their long tap-roots. Autumn transplanting is preferred, the top being cut back severely, but the roots retained as much as possible. The trees succeed best upon well-drained, rich, loamy soil well exposed to the sun.

The Japanese persimmon or kaki (*D. kaki*) is a smaller species than the American, rarely exceeding 40 feet in height, some varieties being under 10 feet. It is a native of Japan, China and Korea, where it is one of the leading cultivated fruits. During the closing quarter of the 19th century it was successfully cultivated in the Southern States, and is making its way as a dessert fruit in Northern markets. The fruits, which often resemble tomatoes in appearance, are several times larger than the native species. Some of them resemble apricots in flavor. They have been successfully cultivated in the Atlantic States as far north as Virginia; in the Gulf States and in California. Usually they are propagated by budding or grafting upon seedling stocks of the American species, like which they are cultivated.

Two other species are cultivated for their small black fruits: *D. lotus*, an Asiatic species, in China, Japan and Korea, and *D. texana*, in Texas and Mexico, where it is indigenous.

The persimmon is fairly free from insects, few of which are troublesome. The chewing species, such as caterpillars, can be controlled by arsenites; the sucking species, such as plant-lice and flea-lice, by kerosene emulsion. (See INSECTICIDE). Consult Watts, 'Persimmons,' Tennessee Agricultural Experiment Station Bulletin XI, No. 1; Hadley and Troop, 'The American Persimmon,' Indiana Agricultural Experiment Station Bulletin, No. 60; Bailey, 'Standard Cyclopedia of Horticulture.'

PERSIUS FLACCUS, pėr'shĭ-ŭs, flăk'ŭs, **Aulus**, Roman satirist: b. Volaterræ, Etruria, 34 A.D.; d. Rome, 62 A.D. He was a pupil of the grammarian Virginius Flavius, probably also of Remmius Palæmon, but more important than all of the Stoic Cornutus, whom he celebrated in his verse, and whose teachings he proclaimed and expounded. In Pætus Thrasea, the famous senator and lofty Stoic, he found a patron and close companion. His earlier poetic ventures he burned. But he left six satires, containing only between 600 and 700 lines, which, retouched by Cornutus, were published in a booklet by Cæsius Bassus, a fellow poet. These works won immediate and high reputation. Apparently the obscurity which had become felt as far back as Jerome, and made him "the paradise of commentators," was not sufficient to disturb contemporaries. This unintelligibility seems to be the result of an effort to condense into phrases more meaning than they may clearly bear. Whether or not this is a literary trick has been debated; but such certainly is its effect. Within a limited field Persius evinces keen insight, descriptive gift, and dramatic power. At times he gives interesting glimpses of his studious life, and his devotion to the noble interests of his philosophy. He was a persistent, though none too successful, imitator of Horace, playing generally unsatisfactory changes upon some 100 various lines of the earlier poet. He was seriously in earnest and practically devoid of humor. Many of his pointed expressions have passed into the store of literary quotation. There are editions by Orelli (1833); Hauthol (1837); Jahn (1843; rev. by Bücheler 1886); and, with excellent notes, by Gildersleeve (1875). Conington made a prose rendering into English (1874). Consult also Knickenberg, F. A., 'De Ratione Stoica in Persio' (Marburg 1869).

PERSONAL EQUATION. See EQUATION, PERSONAL.

PERSONAL LIBERTY LAWS, in American history, a general name applied to those statutes passed by the Northern States to protect the negroes within their borders, who had escaped from slavery in the South. They were passed by the States as a protest against the Federal support of the capture of fugitive negroes in the free country of the North. The first acts were passed about 1840, though Indiana and Connecticut had previously provided that fugitives might have a trial by jury. The Fugitive Slave Law (q.v.) of 1850 aroused the most violent opposition in the North, and before 1856 many of the States had passed personal liberty acts. Beside prohibiting the use of State jails these laws forbade State judges and officers to assist claimants or issue writs. Trial was to be given all alleged fugitives. Heavy penalties were provided for the violation of these laws. Such acts were passed in Vermont, Connecticut, Rhode Island, Massachusetts, Michigan, Maine, Wisconsin, Kansas, Ohio and Pennsylvania. Several of the other Northern States, while refraining from passing laws which virtually were in direct opposition to the Federal laws, imposed such restrictions in the administration that all attempts to enforce its provisions were seriously hampered.

Among these obstructionist States were Illinois, Indiana, Iowa and New Hampshere. Of the Northern States, New Jersey and California alone sanctioned the rendition of fugitives. See SLAVERY.

PERSONAL PROPERTY. See PROPERTY.

PERSONALITY, Disorders of. There are certain interesting pathological states of the mind in which the unity of the individual is lost or disordered. In many forms of insanity the whole nature of the patient is altered, and he may have the hallucination that he has become some inanimate object, or that he has lost his soul, or that he has undergone some other profound change of personality. This is due to the fact that the unity and character of consciousness are largely determined by the organic background which underlies all experiences, so that when this changes the continuity with the former self is likely to be lost. However, in these pathological states the continuity of consciousness does not suffer the brusque disruption characteristic of certain mental anomalies which are more definitely disorders of personality. In extreme cases we may find what to all appearances are two or more selves alternating in one body. These may differ in character, in tastes and in their entire stock of experiences; each may feel the rest as intruders in the common body. On the other hand, there may be a greater or less degree of community between the different selves; one may have a partial memory of the experiences of another. Furthermore, the separate selves may coexist, as in the case where an anæsthetic hand exhibits a power of writing things unknown to its possessor. The selves coexisting with the normal self may or may not also have an independent existence and may or may not possess a considerable measure of unification into clean-cut personalities. The «automatism phenomena,» as such manifestations as the writing of an anæsthetic hand are called, may be evoked in normal individuals by means of various modes of suggestion. Alternation of personality is always pathological in nature and is usually due to some shock, mental or physical, in nature, which shatters the personality and causes some of the resulting fragmentary groups of ideas to assume an existence on their own account. According to Freud this shock is generally of a sexual nature, which causes certain experiences to be suppressed, and to assume a consequent individuality of their own. Consult Binet, A., 'Alterations of Personality' (New York 1910); Prince, M., 'The Dissociation of a Personality' (New York 1910); Ribot, T., 'The Diseases of Personality' (tr., Chicago 1906); Sidis and Goodhart, 'Mutiple Personality' (New York 1905).

PERSONATION. See CORRUPT PRACTICES ACTS.

PERSONIFICATION, the representation of things inanimate or of abstract ideas as living things or persons. This is a familiar practice in all the arts; thus we have the statue of liberty and the familiar 'My Country 'Tis of Thee,' both of them implying the personification of an idea which has no real human attributes. Fine examples of personification in poetry are the 'Passions' of Collins and the odes of Gray. Michelanglo's statues of 'Night' and 'Morning'; Guido Reni's 'Dawn'; Titian's 'Beauty, Sacred and Profane' are noble examples of personification in art.

PERSONS TO BE INCORPORATED. See CORPORATIONS, LEGAL.

PERSPECTIVE, Linear. Most people have observed that objects diminish in size as they recede farther and farther from the eye; that parallel lines appear to converge; that in general the appearance of objects differs from the reality. But if we are asked why the appearance differs from the truth, or what the precise appearance must be when the true dimensions and position of the object are known we cannot answer offhand. These must be determined by the principles of *Perspective*.

Perspective Defined.— Perspective is the science and art of representing on a plane surface the appearance of objects according to optical and mathematical principles. In order that the representation of an object may be complete we must represent its correct outline, its proper light and shade and the apparent color. These requirements give rise to two branches of the subject, namely, *Aërial Perspective* and *Linear Perspective*.

Aërial Perspective deals with the appearance of objects as affected by the air, light and shade and color. But as its principles are not yet fully established, we shall devote our attention in this article mainly to Linear Perspective, the exact science, which deals with outline alone. It will teach us the laws governing the apparent position, direction and length of the edges or outlines of objects. We shall first review the principles of the subject and then take up a few practical problems.

1. THE BASIC THEORY OF PERSPECTIVE.

Theory of Perspective Illustrated.— If while standing before a closed window you traced on the glass the outline of an object beyond, seen through it, you drew on the glass a true *picture* or *perspective view* of that object. What took place in this process of tracing? From every visible point of the object there emanated a ray of light termed a *visual ray*, which pierced the glass and entered the eye. The outline you marked was the aggregate of points through which the rays of light from the object pierced the glass. This is graphically illustrated in Fig. 1.

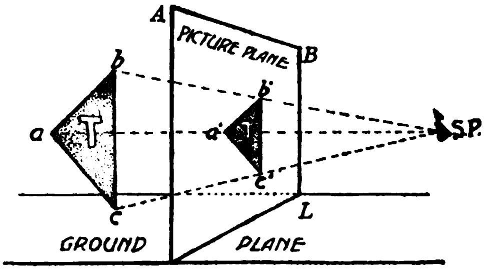

FIG. 1.

Let $S.P.$ in Fig. 1 be the eye of the spectator, $B\ A\ P\ L$ a pane of glass standing on its edge $P\ L$, and T, a triangle behind the glass. From a b and c draw lines to $S.P.$; on the plane $B\ A\ P\ L$ mark the points a', b', c', and connect; then T', drawn on the glass, will be a perspective view of the triangle as seen by the eye at *S.P.* It is evident then that the whole problem of perspective is,—given a pyramid of light, its base at the various points of the object and its apex at the eye; required to determine the section on a plane cutting the pyramid somewhere between the base and the apex.

The Problem of Perspective Formulated.—The vast majority of objects have their prototypes in the geometric solids—the cube, prism, pyramid, cylinder, etc. Hence in all demonstrations on the theory of perspective, these are used as models. Again, all solids are bounded by plane surfaces; all surfaces are limited by lines; and a line is a consecutive series of points. It is obvious, therefore, that before we can successfully construct the perspective of any solid we must know how to determine the perspective of a given point. Let us then assume a point and try to find its perspective. Our problem will read: Given a ray of light emanating from a point on one side of the vertical plane, and traveling to the eye on the other side of the plane; required to find the point at which that ray will pierce the plane. Before solving the problem we must get a clear idea of the terms, conventions and basic principles of the science.

Terms and Conventions used in Perspective.—In this subject four planes are employed: (1) *The Picture Plane* (*P. P.*, Fig. 2), an imaginary plane placed in front of the spectator, on which the objects are drawn; (2) *The Ground Plane* (*G. P.*), a horizontal plane on which the spectator and the objects viewed are supposed to stand. The intersection of the first and second plane is called the *Ground Line* (*G. L.*), or *Base of the Picture;* (3) *The Horizontal Plane* (*H. P.*), a plane passing horizontally through the eye of the observer, and cutting the Picture Plane at right angles in the line *H. L.*, called the *Horizon Line*, or simply the *Horizon;* (4) *The Central Plane* (*C. P.*), a plane passing vertically through the eye of the observer, and cutting each of the other planes in a right angle.

The position of the eye is fixed by its distance from the ground plane, its distance in front of and from the left-hand or right-hand limit of the picture plane.

The height of the eye is the distance of the eye above the ground.

The *Centre of Vision* (*C.V.*) is the point on the picture plane which is directly opposite the observer's eye. (Fig. 3).

The *Station Point* (*S.P.*) is the point in space at which the eye is held.

The *Distance of the Eye* is the distance from the station point to the centre of vision.

The *Prime Vertical* is a vertical line on the picture plane passing from the centre of vision to the ground line. It is of course directly opposite the spectator.

The *Distance Points* (D^R and D^L) are the distance of the eye (*S.P.—C.V.*) laid off on the horizon, to the right (D^R), and to the left (D^L) of the centre of vision.

The *Perspective of a Line* is the sum of the perspectives of all its points.

The *Vanishing Point* of an indefinitely long line is the perspective of that one of its points which is farthest from the picture plane.

The Fundamental Rules of Perspective.—The basic rules upon which the whole science of perspective rests are:

Rule I.—When a line is parallel to the picture plane, its perspective will be parallel to the line itself. This may be proved as follows:

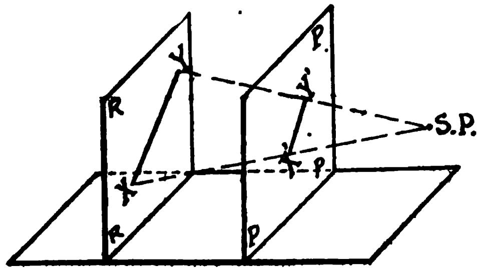

FIG. 4.

Given the line *X Y* in space, parallel to the picture plane *P.P.* (Fig. 4), and *S.P.*, the eye. Through *X Y* pass a plane *R R* parallel to the Picture Plane. Connect *X Y* with *S. P.* The plane of the triangle *X.S.P.Y.* is cut by two planes *P.P.* and *R.R.*, parallel to each other.

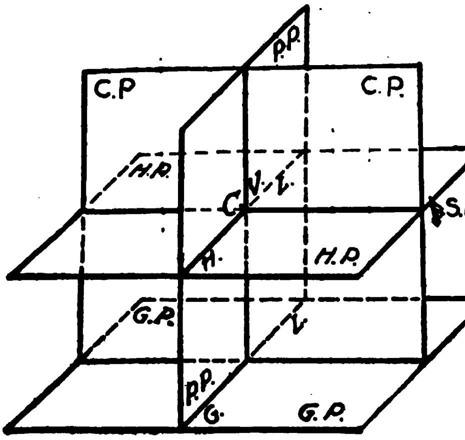

FIG. 2.

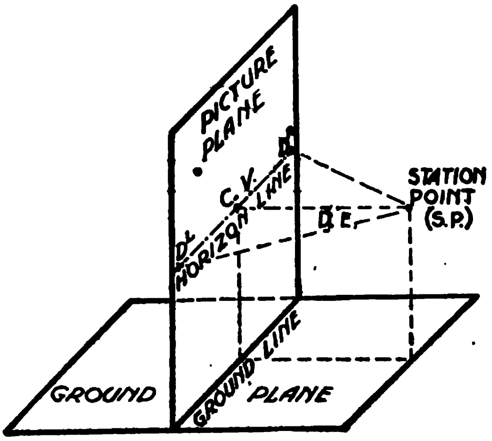

FIG. 3.

Hence the lines of intersection on these planes $X\ Y$ and $X'\ Y'$ are parallel to each other, that is, the perspective of the line is parallel to the line itself. From Rule I we also deduce: (1) That when a horizontal line is parallel to the picture plane, its perspective is parallel to the horizontal line. (2) That a vertical line appears vertical in perspective. (3) That any surface parallel to the picture plane is represented in perspective by a surface, similar but smaller.

Rule II.—When a line is inclined to the picture plane, its vanishing point may be found by drawing from the eye a visual ray, parallel to the line, and noting where this ray pierces the picture plane. This may be proved as follows:

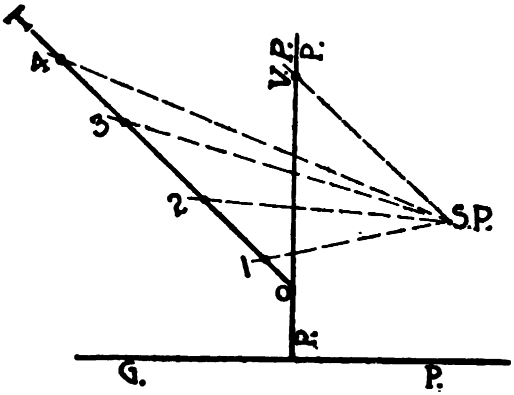

Fig. 5.

Given the line $O\ T$ (Fig. 5), inclined to the *P.P.*, and extending from its intersection with the picture plane at *O*, to infinity. The perspective of any point of this line is found by drawing a ray from the eye to that point and noting where that ray cuts the picture plane. Assume the points 1, 2, 3, 4, on the given line, receding successively from the picture plane. It will be seen that the farther the point assumed is from the picture plane, the more nearly does the visual ray to that point become parallel to the given line. And if the point *T* be assumed at an infinite distance from the picture plane, the ray to that point will be parallel to the line $O\ T$. Hence the vanishing point of the line $O\ T$ is found by drawing from the eye a ray parallel to the given line, and noting where it pierces the picture plane.

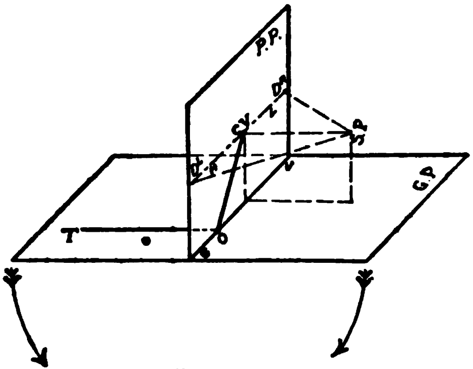

Fig. 6.

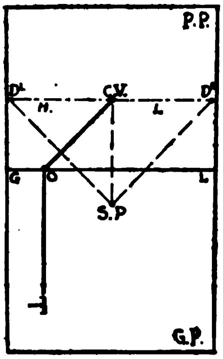

Fig. 7.

From Rule II we deduce: (1) That all parallel lines with the exception of lines parallel to the picture plane, converge to, or vanish in, the same point. (2) That horizontal parallel lines with the exception of lines parallel to the picture plane vanish in a point on the horizon line. (3) That lines perpendicular to the picture plane vanish in the centre of vision. (4) That horizontal lines 45° to the picture plane vanish either in D^R or D^L.

Problem I.—To determine the perspective of a line perpendicular to the picture plane and receding from the picture plane to infinity.

To find the perspective of any line, we need but find the perspective of two of its points, say the beginning and the end of the line, and connect. Let $O\ T$ be the line (Fig. 6), *O* being the initial point in *P.P.*, and *T*, a point at infinity. *O* being in the *P.P.*, is its own perspective; *T* being the infinitely distant end of a line perpendicular to *P.P.* has its perspective at *C.V.* (Rule II, Deduction 3). Connecting these two points in the picture plane, we get *O-C.V.*, the perspective sought.

In Fig 6 we assume the ground plane perpendicular to the picture plane. If we are to represent all this on a flat surface, we must turn the planes in such a manner that they form one continuous surface. This is accomplished by turning both front and rear parts of the ground plane downward, till they lie on the same plane as the picture plane; and viewed from the front, or simply as a picture plane, the work in Fig. 6 assumes the appearance shown in Fig. 7.

Problem II.—To determine the perspective of a horizontal line 45° to the picture plane and receding to infinity.

Let $M\ N$ (Fig. 8) be the line lying on the ground, *M* the initial point in *P.P.*, and *N*, a point at infinity. *M* is its own perspective. *T* will vanish in D^L if the line makes an angle of 45° toward the left, with the *P.P.* (Rule II, Deduction 4). Connecting *M* with D^L, we obtain the line $M\text{-}D^L$, the perspective sought. Revolving the planes as in Problem I, we get Fig. 9.

We can now proceed to find the perspective of a given point, which we set out to do at the beginning.

Problem III.—To determine the perspective of a point.

Let *X* be the point (Fig. 10). Pass through it a line $O\ T$, perpendicular to the picture plane. Its perspective will be *O-C.V.* (Prob. I).

Somewhere on this line will be the perspective of *X*. Through the same point *X* pass another line *M N*, horizontal and at 45° to the picture plane, left or right called a *diagonal*. If the angle is toward the left; its perspective will be *M-D*^{L}. The perspective of *X* will be somewhere on this line too. Being both on *O-C.V.* and on *M-D*^{L}, the perspective of *X* must be at the intersection of the two, namely at *X'*. Revolving the ground plane downwards we obtain Fig. 11.

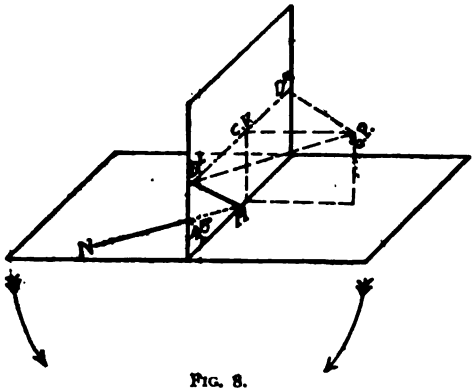

FIG. 8.

Rule III.—Hence, to find the perspective of any point, pass through that point a perpendicular and a diagonal to the P.P.; at the intersection of their perspectives will be the perspective of the point.

II. THE PRACTICE OF PERSPECTIVE.

Before taking up the solution of practical problems, it would be well to know how to find the *plan* and *elevation* of an object, and to understand *drawing to scale*.

The Plan and Elevation of Objects.— Let us take a square prism for illustration. In Fig. 12, in which both planes are assumed transparent, let the square prism be placed so as to rest on one of its square bases on the *G.P.*, some distance back of the *P.P.* If lines be drawn around the edges of the prism where it touches to *G.P.*, we shall obtain what is called the *horizontal projection* or *plan* of the prism. And if we draw perpendiculars from every point of the prism to the *P.P.*, and connect points *ac-bd-AC-BD*, we shall get on the picture plane the *vertical projection* or *elevation* of the prism. Removing the prism and revolving the *G.P.* downward, we obtain Fig 13. Frequently the plan and elevation of an object have to be drawn before the perspective of that object can be determined.

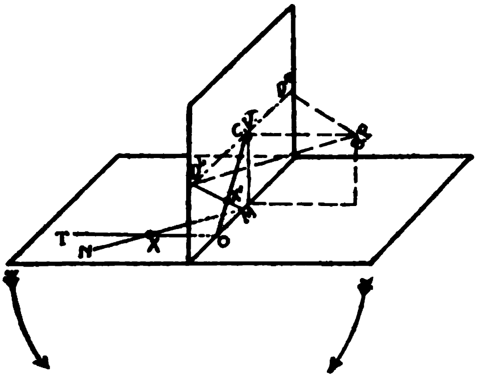

FIG. 10.

Drawing to Scale.— Objects to be rendered in perspective are generally so large that their real dimensions cannot be shown in a drawing; hence in such cases, the drawing is made a certain number of times smaller than the real object. The relative proportion between the drawing and the real size of the object to be represented is called a *scale*. For example, if an object is 12 feet high, and the drawing is made three inches high, the scale is one-forty-eighth, or one-quarter inch to the foot. But to avoid confusion, we shall in the following demonstrations designate and render the size and position of objects in terms of *units of measure*. A unit of measure may stand for a foot, an inch, or any part of an inch, according to the scale used.

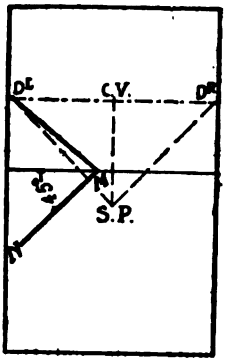

FIG. 9.

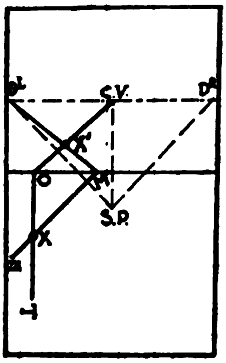

FIG. 11.

Divisions of Perspective.—For convenience, linear perspective is divided into three parts, namely, *parallel*, *angular* and *oblique perspective*, depending on the position of the object with reference to the *P.P.* and the *G.P.*

Parallel Perspective or *One-Point Perspective* refers to that position of the object which makes use of only one vanishing point (*C.V.*), and the two distance points (*D*^{L} and *D*^{R}). Hence it is applied to the drawing of all rectangular objects when so situated that all their faces are either parallel with or at right angles to the *P.P.* A few problems in Parallel Perspective will now be solved. The instruments and materials necessary are: a drawing board, a T square, two triangles (30° and 60°), a protractor, paper, a 2H leadpencil, a compass, a ruling pen, a ruling scale and Higgins' India ink.

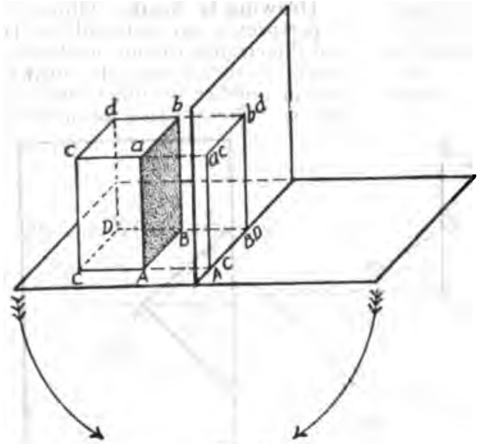

FIG. 12.

Problem IV.—Put into perspective a vertical straight line 3 units high, when the lower end rests on the G.P., 3 units to L. of S. (left of Spectator), and 1 unit within.

Assume the *H.L.* 2 units above the *G.L.*; and the distance of the eye 4½ units (Plate I).

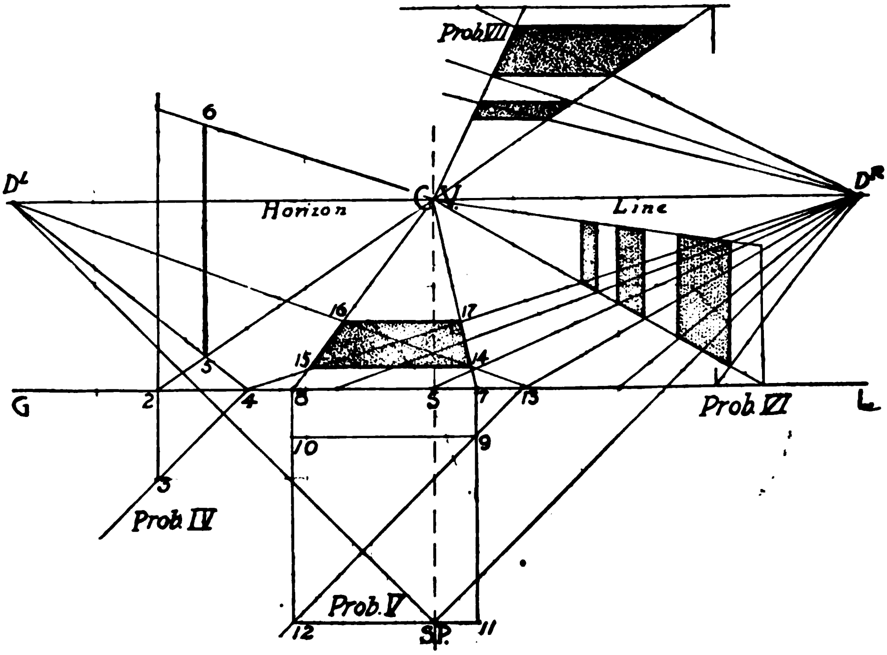

PLATE I.

From *S* mark off on the *G.L.* the point 1, three units to the left, and draw 1–2, the vertical projection or elevation of the line. Draw 1–*C.V.* and 2–*C.V.* One unit below the *G.L.*, mark point 3, the horizontal projection or plan of the line. Through point 3 draw a diagonal to *G.L.*, touching the *G.L.* at 4. Draw 4–D^L. Point 5, where 4–D^L crosses 2–*C.V.* will be the perspective of the lower end of the line (Rule III). At 5, erect a vertical line until it touches 1–*C.V.* at 6, which is the perspective of the upper end of the line. Strengthen 5–6, the perspective of the given line.

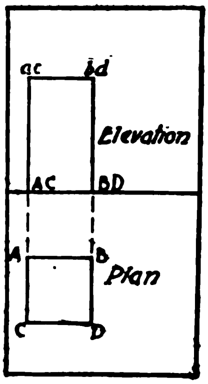

FIG. 13.

Problem V.—Draw a horizontal square plane of 2 units edge, lying on the G.P. with 2 of its edges parallel with the P.P. and its right front corner ½ unit to R. of S., and ½ unit within.

Mark off on the *G.L.* point 7, one-half unit to the right of *S*, and point 8, 1½ units to the left of *S*. Line 7–8 will be the vertical projection of the square. Draw 7–*C.V.* and 8–*C.V.* One-half unit below the *G.L.*, draw the square 9–10–

11–12, the horizontal projection. Through points 9–12, draw a diagonal, touching the *G.L.* at 13. Draw 13–D^L, cutting the line 7–*C.V.* at 14, and the line 8–*C.V.* at 16. Construct lines 16–17 and 14–15, parallel to *G.L.* The figure 14–15–16–17 will be the desired perspective of the square. In many problems we can dispense with the plan entirely. In the last problem, for instance, knowing that the square is one-half unit behind the *P.P.*, we might have measured off directly on the *G.L.* the point 13, one-half unit to the right of point 7, without the aid of the plan and diagonal 12–9. The method of finding the perspectives in Problems VI and VII is evident, and requires no explanation.

Problem VIII.—Draw the perspective of a pavement of squares of 1 unit edge, two of the sides of the squares being parallel to the Ground Line.

Assume the *H.L.* 2½ units above the *G.L.*; and the distance of the eye 4½ units (Plate II).

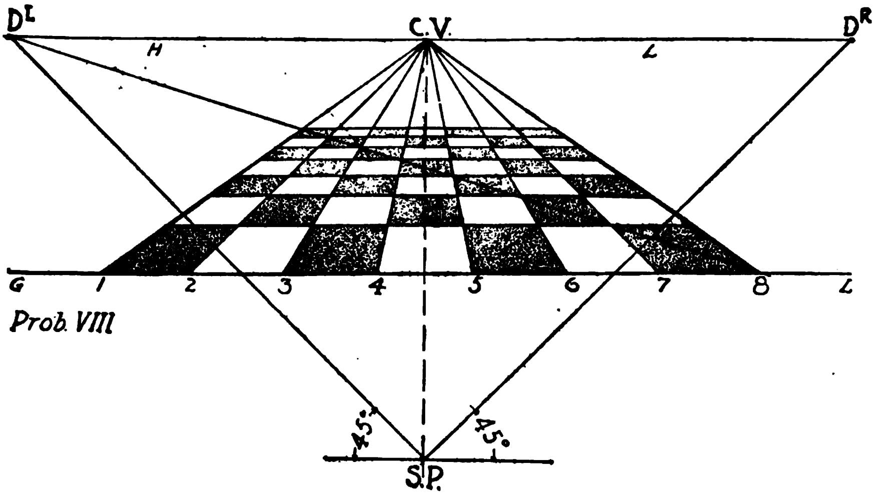

PLATE II

The squares having two of their sides parallel to the *G.L.* their other two sides will be perpendicular to the *P.P.* and will therefore vanish in *C.V.* D^L and D^R will be the vanishing points of the diagonals. Mark off on the *G.L.* at 1, 2, 3, 4, etc., distances of one unit each. Through these draw to *C.V.*, lines which are the perspectives of the sides of the squares, perpendicular to the picture, intersect these by a diagonal drawn from any point, as 8, to D^L; and through the points of intersection, draw lines parallel to the *G.L.*

Problem IX.—Put into perspective a cube of 1¾ units edge, standing on the G.P. with the front face parallel to the P.P. and its right lower corner 1¾ units to the left of S., and one-half unit within.

Construct the elevation, 1-2-3-4 (Plate III, Prob. IX), and draw the lines 1-*C.V.*, 2-*CV.*, 3-*C.V.* and 4-*C.V.* on the *G.L.* mark off point 5, ½ unit to the left of point 1. Draw the line 5-D^L, cutting, 1-*C.V.* and 2-*C.V.* in points 6 and 8, respectively. Through points 6 and 8 draw the lines 6–7 and 8–9, parallel to the *G.L.* The resulting figures, 6–7–8–9, will be the base of the cube. On points 6, 7, 8 and 9 erect perpendiculars cutting the lines 3-*C.V.* and 4-*C.V.*, at points 10, 11, 12 and 13. Connect 10 with 11, and 12 with 13. Make line 7–8, 8–9 and 8–12 dotted. The figure 6–7–8–9–10–11 is the perspective of the given cube.

Problem X.—Draw the perspective of a wooden cross, 1 unit in section, the long beam being 4 units long, and the short one 3 units. The distance from the lower end of the long beam to the under side of the cross beam is 2 units. The cross is standing on the lower end of the long beam with the square end of the cross beam in the P.P. The extreme right corner of the square end is 3¼ units to R. of S.

Draw the elevation 1–2–3–4. From points 1, 2, 3, 4, 5, 6, 7 and 8 draw lines to *C.V.* The square end 5–6–7–8, being in the *P.P.* is its own perspective. To the left of 1, mark off points *a, b, c* one unit apart; connect these with D^R. At points 9, 10, 11, 12, 19 erect perpendiculars, limited by the lines running to *C.V.* Accent the visible lines.

In the perspective of the bridge (Prob. XI) one new element enters which requires explanation — the rendering of the semi-circular arch. The method of construction is as shown on Plate IV.

To the left of line 1–2, and at a distance from the *G.P.* equal to that of the arch, construct the square 3–4–5–6 of 1½ units edge; in this inscribe the quadrant 3–4–5. Draw the diagonal 3–6, cutting the quadrant at point 7; through this point draw a line parallel to 5–6. Connect points 6, 8 and 4 with *C.V.* In the proper place construct the half square 9–10–11–12; and from point 13 draw the lines 10–13, 11–13, cutting the line 8-*C.V.*, at points 15 and 16. The curve connecting points 9, 15, 14, 16 and 12, will be the required perspective of the arch.

We are now ready to consider the second division of perspective, namely,

Angular Perspective.— This branch of perspective is applied to the drawing of all rectangular objects that make angles other than right angles with the picture plane. Hence it makes use of two vanishing points, both on the horizontal line. For this reason it is sometimes called *Two-Point Perspective.*

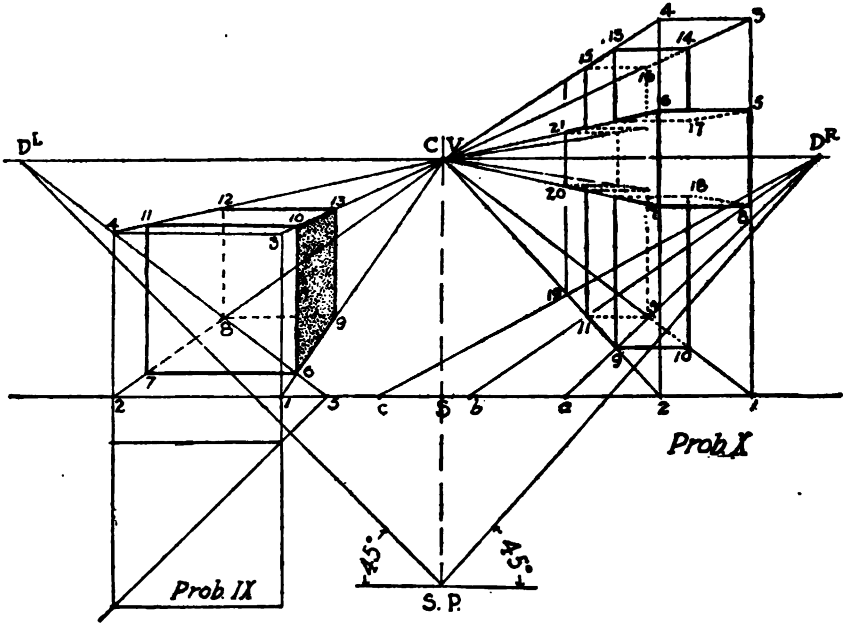

Plate III.

Problem XII.—Making a perspective drawing of a cube of 1½ units edge, resting on the G.P., with its horizontal edges vanishing to the right at 60°, and to the left at 30° with the P.P. The nearest corner on the ground being 1 unit to R. of S., and ½ unit within. See Plate V.

Assume the *H.L.*, *G.L.* and *S.P.* (station point). At *S.P.* to the right, make an angle of 60° with the line *D.L.* (directing line), and continue the line forming the angle until it touches *H.L.* at *V.P.* 60°. All lines in the cube 60° to the *P.P.* will vanish at this point. To the left, at *S.P.*, make an angle of 30°, and continue the line until it touches the *H.L.* at *V.P.* 30°. All lines in the model inclined 30° to the *P.P.* will vanish at this point.

Every vanishing point must have a measuring point (*M.P.*) for all lines that vanish at it. To find the *M.P.* for *V.P.*60°, lay-off on the *H.L.* the distance from *V.P.*60° to *S.P.* Similarly find the *M.P.* for *V.P.*30°.

On the *G.L.* mark off point 1, 1 unit to *R.* of *S.* and 2, ½ unit to the *right* of 1. Draw 1-*C.V.*, and 2 D^L, intersecting at 3, the nearest point of the cube on the ground. Draw 3-*V.P.* 30° and 3-*V.P.*60°. From *M.P.*30° draw a line

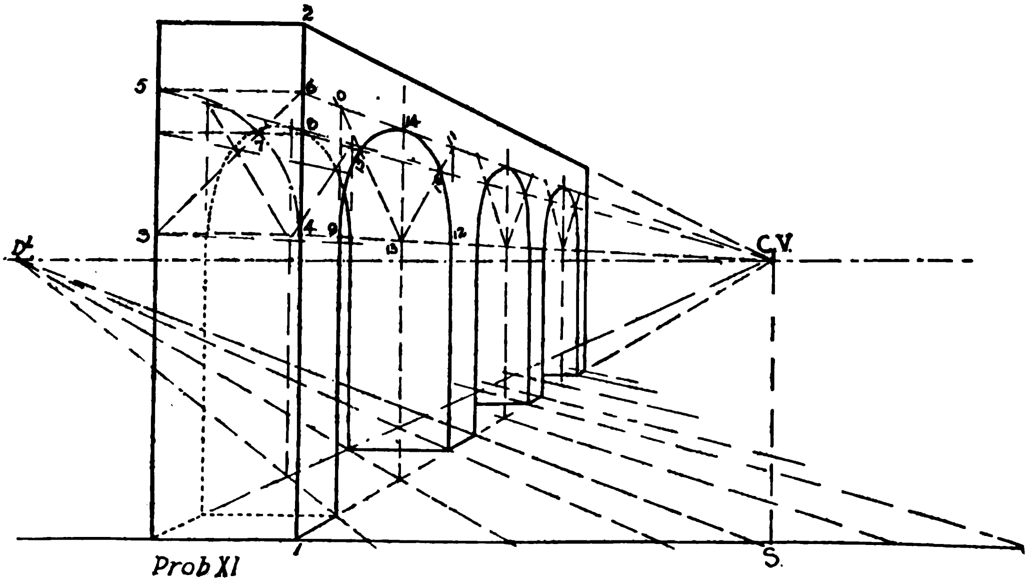

Plate IV.

through 3, touching *G.L.* at 7. Mark off 1½ units to the left of 7, giving us point 8, and draw 8-*M.P.*30°, cutting 3-*V.P.*30° at 9. From *M.P.*60° draw a line through 3, touching the *G.L.* at 4. From 4 mark off on *G.L.* 1½ units to the right at 5, and draw 5-*M.P.*60°, cutting 3-*V.P.*60° at 6. Draw 9-*V.P.*60° and 6-*V.P.*30°, intersecting at 10, the rear corner of the cube. Prolong 3-*V.P.*60°, touching the *G.L.* at 11. On 11 erect a perpendicular 11-12, 1½ units high, and connect 12 and *V.P.*60°. On 3 erect a perpendicular, touching 12-*V.P.*60° at 14, and one on 9, touching 13-*V.P.*30° at 15. Draw 15-*V.P.*60° and 14-*V.P.*30°, intersecting at 16. Construct the perpendicular 10-16, completing the cube. Make lines 9-10, 10-16 and 10-6 dotted, and accent the others.

The third division of perspective known as *Oblique Perspective* or *Three-Point Perspective* refers to that position of rectangular objects in which there are three systems of vanishing lines. It is applied to the representation of lines that make angles other than right angles with the *G.P.* and the *P.P.;* for example, in gable edges of house roofs. The work is too complicated and advanced to be taken up here.

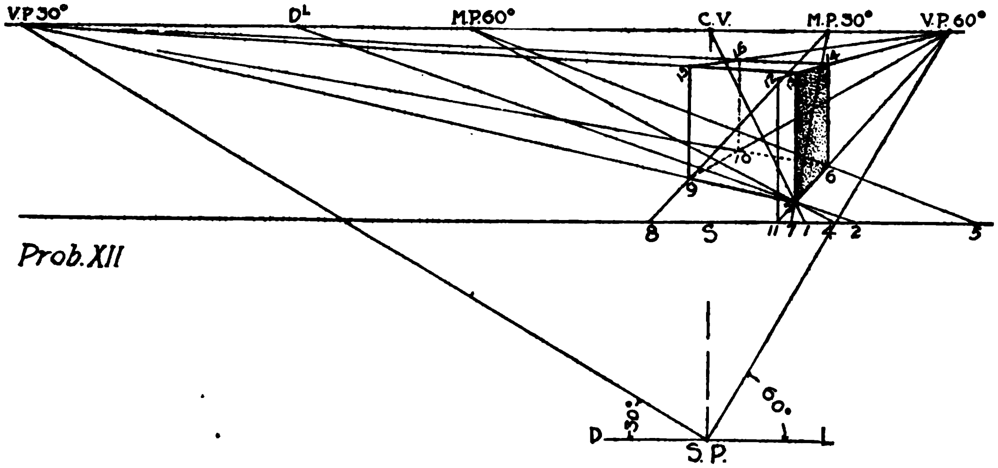

Plate V.

Perspective, Sculptural.— Owing to the action of aërial and linear perspective, statues and reliefs designed for positions high above the eye-level naturally appear changed in size, form and degree of distinctness, when viewed from below. For instance, a figure, which looks tall and graceful at the eye-level will appear short and squat above the eye, and a subject, modeled in very low relief, will be vague and indistinct in an elevated position. Therefore, when the sculptor models a statue for a position on the façade or spire of a church, he deliberately exaggerates the proportions and forms of his subject in such a manner that they will appear natural when viewed from the ground. This forms a special study, known as *sculptural perspective.* The ancient Greeks understood it and used it to advantage in the pediments and metopes of their temples. The works of Donatello, Michelangelo and Rodin also show mastery of this form of perspective.

Architectural Perspective refers to the rendering of architectural subjects as dwelling-houses, mansions, public libraries, churches, railway stations and theatres in linear perspective. It is customary for an architect to express his ideas for a proposed building in two distinct ways. At first he produces a series of working-drawings, consisting of plans, elevations and sections of the structure, drawn to a proper scale, and conveying precisely the information necessary for the builders. But the plans and elevations represent in each case only two dimensions and do not exhibit the natural aspect of the structure from a given point of view. Hence, to supply the deficiency, he also renders his designs in linear perspective.

History of Perspective.— A thorough study of the plastic and graphic arts of the ancient Egyptians and Assyrians reveals the fact that they were absolutely ignorant of all the branches of perspective. The Greeks understood sculptural perspective, but knew nothing of the linear and aërial phases of the subject. It is in the Roman age that artists first became aware of the phenomenon of foreshortening. Thus in some of the frescoes at Pompeii we find positive attempts at rendering buildings in perspective, although with little success.

The honor of having been the first to solve the problem of linear perspective rests with the Florentine realistic painter, Paolo Ucello (1397-1475). Its application in his fresco 'The Flood' in the church of Saint Maria Novella at Florence is quite successful. Following his example, the subject was attacked with enthusiasm by his contemporaries, especially by the architects Filippo Brunelleschi and Leo Battista degli Alberti who formulated and wrote down the principles of the science. Alberti's treatise, 'De Pictura Libri tres,' formed the textbook on the subject for generations of artists, and is even to-day quite readable.

It was the Dutch and Flemish schools of painting that first introduced aërial perspective in their pictures, as may be seen in the interiors of Pieter de Hooghe, in the architectural paintings of Van der Heyden, in the landscapes of Hobbema and in the figure pieces of Rembrandt. Later it was adopted by the Italian, Spanish, English and French schools. The artists of modern times who have especially distinguished themselves as masters of aerial perspective are Corot, Daubigny, Mauve, Israels, Maris and Monet.

Bibliography.— There are very many excellent treatises on perspective by American, English, French and German authorities. The most important are Maillard de la Gournerie, J. A. R., 'Traité de perspective linéaire' (Paris 1898); Lawrence, W. H., 'Principles of Architectural Perspective' (2d ed., Boston 1904); Pratt, Robert, 'Perspective Including the Projection of Shadows and Reflections' (New York 1901); Seeberger, Gustav, 'Principien der Perspektive' (7th ed., Munich 1900); Spanton, J. H., 'Complete Perspective Course' (London 1900); Storey, G. A., 'The Theory and Practice of Perspective' (Oxford 1910); Ware, W. R., 'Modern Perspective' (rev. ed., New York 1905).

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PERSPIRATION, or SWEAT, the fluid secretion of the sudoriferous glands (sweat-glands) of the skin. The term perspiration is, however, sometimes used to include all the secretions of the skin, such as those of the sebaceous glands or follicles, etc. The sweat consists of part of the watery constituents of the blood, separated therefrom by the sweat-glands and eliminated on the surface of the skin in drops of fluid. The sweat-secretion, in ordinary circumstances, is evaporated from off the skin as fast as it appears. But after violent exercise, when the body is exposed to a great heat, or in certain diseases, the perspiration may collect in greater quantity and appear in the form of visible drops of fluid. The sweat-glands are situated in the subcutaneous adipose or fat-tissue of the skin. Each consists of a coiled-up tube, forming a glandular structure, which is invested by a capillary net-work of blood-vessels. The tube is continued in a somewhat wavy course upward through the cutis or true skin. When it enters the epidermis it becomes spiral and it continues to ascend through this superficial layer of the skin in a tortuous course till it opens on the surface in an oblique aperture. The duct is lined by epithelial cells, continuous with those of the epidermis itself. The openings of the sweat-ducts are the pores of the skin. The largest and most numerous ducts are situated in the armpit. The palm of the hand is also well supplied. Their number in this situation has been estimated by different authorities at from 2,736 to 3,528 to the square inch. The sole of the foot is also abundantly supplied; and these ducts and glands occur, in less numbers and of smaller size, over the entire body surface. In the neck and back they number only about 417 to the square inch and the entire number in the body is estimated at 2,381,428. If placed together the openings of the entire sweat-glands would form, it is calculated, an evaporating surface of about eight square inches; that is, reckoning each orifice or sweat-pore to present a diameter of one fifty-sixth of a line. The line, as Krause estimates it, is equal to one-tenth of an inch.

The insensible perspiration of the skin is a term used by physiologists to denote the matters evaporated from the skin, and which are thus continually being got rid of without being noticed. When the sweat collects in drops on the skin-surface it is termed sensible perspiration. The primary factor determining the amount of sweat excreted is nervous dilatation of the blood-vessels; heat, etc., are only secondary factors. In this respect the skin is unlike the kidneys.

The analysis of sweat has always formed a matter of dispute, chiefly from the difficulty of obtaining the secretion in sufficient quantity to make an exact estimate of its compounds. In ordinary sweat, water, carbonic acid and sebaceous matter may be assumed to be the chief constituents. Thenard, analyzing the sweat obtained from a flannel shirt washed in distilled water, found chloride of sodium, acetic acid, phosphate of soda, phosphate of lime, traces of oxide of iron and an animal substance. Berzelius obtained chloride of sodium, chloride of ammonium and lactic acid in sweat from the forehead. Anselmino, in the sweat collected from his own arm placed in a glass cylinder, found water, carbonic acid and acetate of ammonia; and from the dried residue or ashes of sweat he obtained soda, in the form of the sulphate, phosphate, and carbonate, potash, chloride of sodium; phosphate and carbonate of lime; and oxide of iron (traces). A certain amount of urea is generally regarded as a normal constituent of sweat-fluid. Gorup-Besanez says that the general and ordinary composition of perspiration is included under the list of water, fat, urea, acetic, butyric and formic acid and salts — the latter being chlorides of sodium and potassium, earthly phosphates and sulphates, together with oxide of iron.

The quantity of sweat evolved from the skin varies according to temperature and exertion from a small value to more than two pounds an hour. The carbonic acid got rid of by the skin is calculated to amount to about one-fiftieth of that exhaled by the lungs, this calculation applying to warm-blooded animals only. In amphibians (frogs, etc.), in which the skin plays a more important part in respiration, the amount of carbonic acid exhaled is much greater than that above stated to occur in warm-blooded animals. A frog, the lungs of which had been cut out, generated by its skin one-quarter cubic inch of carbonic acid in eight hours. The amount of watery vapor secreted by the skin has been roughly calculated to amount to double of that exhaled by the lungs in the same or during any given time. The entire subject of transpiration by the skin shows how very closely connected is that function with respiration and excretion by the kidneys. The skin of man eliminates about as much water as the kidneys, but much less solid matter. Perspiration is essentially not an excretory, but a heat-regulating function. See RESPIRATION; SKIN.

PERTH, Canada, county-seat of Lanark County, Ontario, situated on the Tay, and the Canadian Pacific Railway, 50 miles southwest of Ottawa. It contains a public library, collegiate institute and fine municipal buildings. There are also foundries, machine shops, sash and door factories, mineral water works, felt and carpet factories, knitting mills, boot and shoe factories, etc. Pop. 3,588.

PERTH, Scotland, city, capital of the county of the same name, and a great railway junction on the right bank of the Tay, here crossed by an elegant bridge of nine arches, a steel girder bridge (1900) and a railway bridge, 43 miles north-northwest of Edinburgh.

The town is laid out with considerable regularity, and contains several spacious streets, handsome terraces and crescents. The public buildings include the municipal building, a handsome edifice in the Tudor style; the county building, an elegant Grecian structure facing the Tay; the penitentiary or general prison, the city and county infirmary, the Royal Lunatic Asylum, finely situated on the north side of Kinnoull Hill; the public hall, in the Scottish baronial style; the handsome new post office; the Academy; Sharp's Educational Institution and various other schools; the attractive building of the Antiquarian Society, called Marshall's Monument, which contains a public library in addition to the museum of the Society; the Sandeman Public Library; the railway station, one of the finest in Scotland, etc. Among ecclesiastical buildings are Saint John's Church, an ancient structure in the pointed style, with a massive square tower, terminating in a spire, originally forming only one church, but now converted into three parish churches; Saint Paul's, also a parish church, of modern erection, with a lofty steeple; a handsome Episcopal cathedral and other churches.

Of industrial establishments the chief are large dye works, iron-founding and engineering industries, textile works, rope and twine (the great staple industry). There are also bleachfields. The shipping trade is small. There are extensive auction sales of cattle and other stock. The North and South Inches form beautiful public parks.

Perth was formerly known as Saint Johnstoun. It was created a royal burgh in 1210 by William the Lion, and the Scottish Parliament repeatedly assembled here. Among the most remarkable events connected with it are its capture and the carrying off of its records by Edward I of England in 1298; the bloody conflict on the North Inch between Clan Chattan and Clan Kay (1396); the murder of James I in 1437; the various events connected with the progress of the Reformation; the Gowrie conspiracy or Raid of Ruthven in 1600; the capture of the town by Montrose in 1644, after his victory of Tippermuir; its capitulation to Cromwell in 1651, and its occupation, first by Viscount Dundee in 1689 and afterward by the Highlanders in 1715 and 1745. Scone, the ancient place of coronation of the Scottish kings, is in the immediate neighborhood. Pop. 35,854.

PERTH, Western Australia, the capital of the state, on the Swan River, 12 miles above the port of Fremantle, which is situated at the mouth of the river. A macadamized road, constructed by convict labor, connects Perth with Fremantle, and there is also regular communication by water and rail. The city is built on a slope, washed at its base by a lake-like expanse known as Melville Water. The streets are regular and moderately wide. The principal public buildings are the city hall, the chambers of the legislative council of the state, an assembly room and offices, two cathedrals, one Protestant and one Roman Catholic, a hospital, government offices, pensioners' barracks, a handsome mint, a fine new music hall, a mechanics' institute containing a museum, the Victoria public library, art gallery, government house, the high school, government and Roman Catholic schools and some handsome hotels and private residences. The waterworks are municipally owned and there is a good tramway system. A university was established in 1912. Pop. about 55,000.

PERTH, The Five Articles of, a measure, passed in a general assembly of the Church of Scotland, convened 25 Aug. 1618 at Perth by the order of James VI. The first required communicants to receive the elements kneeling; the second permitted the celebration of the Holy Communion privately in case of sickness; the third allowed private baptism on sufficient cause; the fourth required that children of eight years should be confirmed; and the fifth enjoined the religious observance of Christmas Day, Good Friday, Easter Day, Ascension and Whitsunday or Pentecost. These articles were accepted by the Estates in 1621, but were opposed by the Presbyterians of Scotland as an undue interference with the very constitution of the assembly. These articles became the source of much serious dissension between king and people, and in the general assembly held at Glasgow in 1638 the assembly of Perth was declared to be unlawful and null, and the Five Articles were formally condemned.

PERTH AMBOY, ăm-boi', N. J., city, port of entry, in Middlesex County; on Raritan Bay, at the mouth of the Raritan River, and on the Central Railroad of New Jersey, the Staten Island Rapid Transit, the Lehigh Valley, the New York and Long Branch and the Pennsylvania railroads, about 15 miles south of Newark and 21 miles in direct line south by west of Battery Park, New York City. It has extensive shipping interests on account of its good harbor. In the vicinity are valuable deposits of fire-clay. The first white settlement was made about 1683 at the site of an Indian village called «Amboy.» The settlers were from Scotland and they named the place Perth, in honor of James, Earl of Perth. Soon after the Indian name «Amboy» was added. It was the capital of the province nearly all the time it was held as a colony of Great Britain. In 1776, William Franklin, the last British governor of the province, was captured here. It is a commercial and industrial centre of importance. The latest industrial census reported $61,814,000 invested in industries; the cost of materials used was reported as $135,745,000, and the value of products $148,960,000. There were 128 industrial establishments employing 10,556 persons, of whom 9,202 were wage-earners, who received $4,906,000 in wages, an average of $533 per wage-earner per year. The sum of $1,849,000 was paid in salaries to 1,252 salaried employees, a total of $6,755,000 for all services, while $13,215,000 was the amount added by manufacture to the raw materials. The war stimulated the city's industries very greatly, the above figures being dwarfed during the years 1917 and 1918. The chief manufacturing establishments are large lead and copper smelting and refining plants, ship-building and repairing yards with dry docks, emery mills, brick, terra cotta, fire brick, white ware, drain pipes, handkerchiefs and underwear, corks, cables, iron and steel works, chemical works, cartridges and munitions factories, copper works, and railroad shops and yards. There are about 9,000 employees in the manufactories. The city has a high school, public and parish schools, a public library, one daily and three weekly newspapers. The three banks have a combined capital of $500,000. The city owns and operates the waterworks and an electric-light and power plant. Pop. 39,700.

PERTHES, pĕr'tĕs, **Friedrich Christoph**, German publisher and patriot: b. Rudolstadt, 21 April 1772; d. Gotha, 18 May 1843. After an apprenticeship of six years with a bookseller in Leipzig, he went to Hamburg in 1793, and in 1796 established himself there in the same business. In 1810 he initiated the patriotic publication known as *The National Museum*, to which men of eminent intellectuality were contributors, in an effort to arouse the patriotism of the People. On account of this ardent opposition to Napoleon's extension of power he was obliged to leave the city when it became a part of the French empire, and he remained in virtual exile until 1914. In 1821 he sold his interest in the business to his partner and moved to Gotha and founded there a prosperous publishing business, chiefly of historical and theological literature. In his extensive correspondence with men of note he accumulated a most valuable collection of autograph letters. An uncle of his, J. G. Justus Perthes, was the founder of the firm Justus Perthes of Gotha, celebrated later as the publishers of the famous geographical work 'Petermann's Mitteilungen,' and of the 'Almanach de Gotha.'

PERTINAX, pėr'tĭ-năks, **Publius Helvius**, Roman emperor: b. Alba Pompeia, in Liguria, 126 A.D.; d. Rome, Italy, 28 March 193 A.D. He was well educated, entered the army and distinguished himself in the service, attracted the attention of Marcus Aurelius who elevated him to the consulate in 179. He was in command of the legions which crushed the revolt in Syria, was governor in turn of Mœsia, Dacia and Syria, and under Emperor Commodus was placed in command in Britain. Later he became pro-consul of Africa and finally prefect of Rome. He was banished with others on suspicion of having been concerned in a conspiracy against Commodus; but on the death of the latter he was proclaimed emperor by his soldiers, 31 Dec. 192 and immediately set about forming a government which was to reform the abuses countenanced by his predecessor. He was well received by the senate and the people, but owing to the treachery of Lætus, prefect of the Prætorian Guard, who feared the loss of his own supremacy, Pertinax failed to retain the confidence of the Guard and was assassinated by that body three months after his accession.

PERTURBATIONS, *in astronomy*, deviations in motion of planets or comets from their fixed orbits or from the regular velocity in those orbits. They are regarded not as drawing the planets out of their orbits, but more in the light of change in elements of the orbits themselves.

PERU, Ill., city in Lasalle County; on the Illinois River and the Illinois and Michigan Canal, and on the Chicago, Rock Island and Pacific, the Chicago, Burlington and Quincy and the Chicago, Ottawa and Peoria interurban railroads, about 100 miles southwest of Chicago and 55 miles northeast of Peoria, five miles from Starved Rock and five miles from Deer Park, and at the head of navigation on the Illinois River. It was settled in 1827 and founded as a village in 1834. It was granted a city charter in 1852. In the vicinity are relics of the Mound Builders. Peru is in a locality favorable for manufacturing; large bituminous coal fields are near, and deposits of white-sand rock and cement rock. The chief manufacturing establishments are foundry and machine shops, planing mill, fertilizer works, grain elevators, clock factory, nickeloid works, zinc-rolling mills, scale works, plow and wheel works, furniture factory, shirt factories, acid factories, zinc smelters, nail and glazier paint factories, novelty works, weather-strip factories, implement factories, cigar and tobacco factories and furnaces. There are several wholesale houses. The city is the seat of Saint Bede College, opened in 1891 by the Benedictine Fathers, and it has public and parish schools and a free library, non-sectarian hospital and one of the very best hotels along the whole valley and large parks. The city owns and operates the electric-light plant and the waterworks. Pop. 9,326.

PERU, Ind., city, county-seat of Miami County; on the Wabash River, and on the Chesapeake and Ohio of Indiana, the Wabash, the Lake Erie and Western railroads, about 74 miles north of Indianapolis. Electric lines run to Warsaw, Indianapolis and elsewhere. It was settled in 1827, in 1834 was laid out as a town, and chartered as a city in 1852. There is a municipal park on the river and an amusement park nine miles away. It is in an agricultural section of the State, and is the commercial centre for a large extent of country. The chief manufacturing establishments are confectionery factories, glass works, steel works, wagon and carriage factories, woolen mills, carbon works, bagging and basket factories and railroad shops. It has a large trade in its own manufactures and in farm products. The city owns and operates the electric-light plant and the waterworks. Some petroleum is found near by. Pop. 10,910.

PERU, Balsam of. See BALSAMS.

PERU, pĕ-roo' (Sp. pā-roo'), **Republic of**, a country occupying a part of the western side of South America. Its boundaries touch on the north, Ecuador and Colombia; on the east, Brazil and Bolivia; on the south, Chile; on the southwest and west lies the Pacific Ocean, with a coast line of 1,350 miles. The location of these boundaries has been the source of many and serious disputes, which have in recent years been gradually settled through peaceful arbitration — with Colombia in 1909; with Brazil in 1910, and with Chile in 1912. The controversy with Ecuador, involving an area of about 100,000 square miles lying about the headwaters of the Amazon, was in a fair way of being settled when the European war broke out, but has been indefinitely postponed. No thoroughly reliable surveys of the eastern district have ever been made. Estimates of the total area are, therefore, naturally far apart, but the total area claimed officially (1919) is 679,600 square miles.

Political Divisions.— In 1917 the country was divided into 19 departments and three provinces. The accompanying table shows their areas, and population figures as officially estimated in 1896; since which there has been no attempt at enumeration. The British foreign office in 1908 estimated the total population at 4,500,000, and this corresponds very closely with the figures in the table and bears out the opinion of travelers that the population of Peru is stationary. In the Peruvian census of 1876 — the latest taken — the population was made up of 13 per cent white persons; 1.9 per cent negroes; 57.6 per cent Indians (South American); 24.8 per cent mestizos (Cholos and Zambos), and 1.9 per cent Chinese and other Asiatics. These figures are considered approximately correct at the present day. The 18 departments in turn are subdivided into 102 provinces.

DEPARTMENTS	Area (square miles)	Population	Capital	Population
Amazonas	13,943	70,676	Chacapoyas	4,000
Ancachs	16,562	428,703	Hararas	17,000
Apurimac	8,187	177,387	Abancay	3,000
Arequipa	21,947	229,007	Arequipa	35,000
Ayacucho	18,185	302,469	Ayacucho	14,346
Cajamarca	12,538	442,412	Cajamarca	12,000
Cuzco	156,270	438,646	Cuzco	15,000
Huancavelica	9,251	223,796	Huancavelica	4,000
Huanuco	14,024	145,309	Huanuco	7,500
Ica	8,718	90,962	Ica	10,000
Junin	23,347	394,393	Cerro de Pasco	15,000
Lambayeque	4,614	124,091	Chiclayo	13,000
Libertad	10,206	250,931	Trujillo	15,000
Lima	13,310	298,106	Lima	143,500
Loreto	288,456	100,596	Iquitos	12,000
Madre de Dios	24,747	16,000	Maldonado	3,500
Piura	16,825	213,909	Piura	14,000
Puno	41,198	537,345	Puno	6,000
NATIONAL PROVINCES				
Callao	14	48,118	Callao	34,346
Moquegua	5,549	42,694	Moquegua	5,000
Tumbes	1,980	8,602	Tumbes	....
Total	709,871	4,574,608		

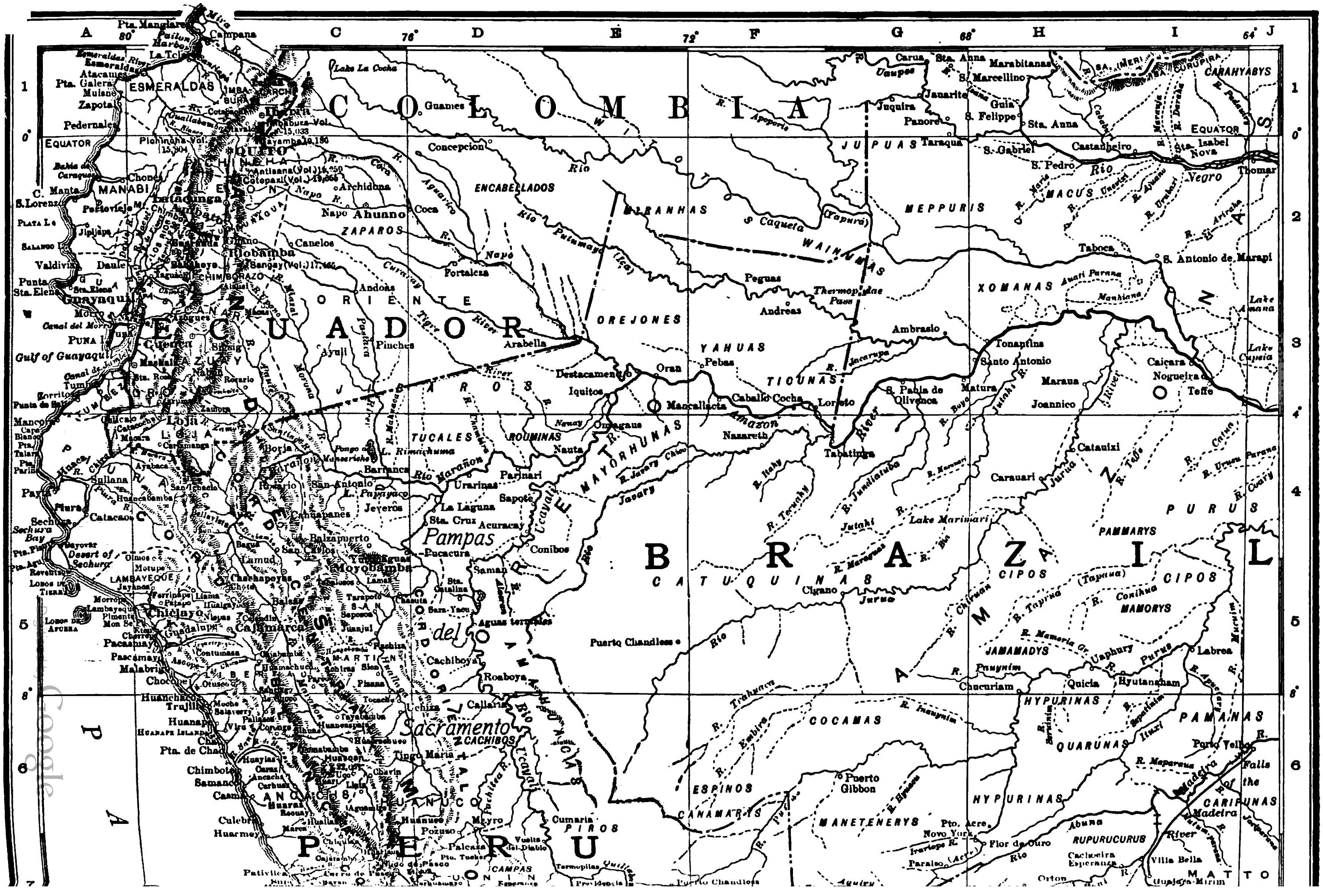
Topography and Hydrography.—The Maritime Cordillera, rising about 20 miles from the coast, and the great ranges of the Andes farther inland, divide Peru into three principal regions: (1) The central, called the tierra, including the parallel chains of mountains — the Maritime Cordillera, Central Cordillera and the Andes — together with transverse ridges, tablelands, deep gorges and intermediate valleys; (2) the Montaña, all that territory lying between the eastern Andean slope and the Brazilian and Bolivian frontiers; (3) the coast region, a practically arid belt about 30 miles in width along the Pacific, with oases along the 46-river courses crossing it. In the Sierra the mountains of the western section are volcanic, while those of the east have an entirely different geologic history. To the former are ascribed the violent earthquakes which have so often afflicted the country; the latter are famous for their past and present production of gold and silver. Both western and eastern ranges show through their whole extent peaks of great height (16,000 to 22,000 feet), the crowning summit, Coropuna, reaching 22,900 feet, and the twin-peaked Huascaran, 22,240 feet. The heart of the sierra, where Inca semi-civilization arose, is in a comparatively limited section, extending about 380 miles from south to north, between the great transverse ridge of Vilcañota and that of Cerro de Pasco. The main natural features of the Montaña are the rivers Marañon, Huallaga and Ucayali, each of these being navigable, and all uniting to form the stream which here is called the Solimoës, but on its lower reaches, the Amazon. The sources of the first two are in the interior of the Sierra. On the other hand the southern portion of the Montaña forms its rivers on the eastern slope of the Andes, and sends them as affluents to the Madeira system. The most important of these are the Purus, Madre de Dios and Beni rivers. The absence of rain on a large part of the Pacific Coast is due to the fact, mentioned in the article SOUTH AMERICA (q.v.), that the prevailing winds from the east lose all their moisture in passing over the Andes. Fogs and mists, however, are the source of very heavy dews, which are sufficient in many places to sustain a growth of grass. Forty-six rivers rising in the central or western Cordilleras, make their way to the ocean across this desert, their waters in some cases being utilized to irrigate the great sugar plantations in this coastal plain. The principal lakes are Titicaca, 12,545 feet above sea-level, now about 130 miles in length, but formerly much longer, and from 40 to 60 miles in breadth, its southern portion extending into Bolivian territory; Arapa; Umayo; Chinchaycocha, 36 miles long and 7 miles wide, and Parinacocha, 12 by 6 miles.

Climate.— The line of perpetual snow is usually about 16,400 feet, though in some situations only 15,400 feet, above sea-level. The elevated plains stretching between the mountain peaks are often exceedingly cold; the climate of the numerous deep valleys, however, is tropical, and that of the intermediate slopes temperate. The rarefied atmosphere of the cooler uplands is healthful in certain respects only. Tropical conditions prevail on the lower altitudes of the Montaña and in the coast region, but with a marked difference: the former is exceedingly rainy, and the latter, from November to April, has no rainfall whatever, although the humidity is high — 72° to 84°. By a law of 22 Dec. 1916 the government made provision for a vigorous campaign against malarial conditions throughout the country. The work involves the treatment of patients, the protection of people in regions where the disease is endemic, the destruction of insects transmitting germs and the drainage or special treatment of swampy lands. In connection with the campaign quinine is admitted free of all duties.

Flora and Fauna.— The coast region is treeless except for the mesquite and the Australian eucalyptus, which have been successfully introduced in some sections. The great forests which cover two-thirds of the entire area of Peru lie in the Montaña division. They contain an untold wealth of tropical timber trees of the most valuable woods: ebony, mahogany, cedar and other cabinet woods, besides dye-woods, innumerable rubber trees in several varieties and many wild olive trees. The cinchona tree, from which quinine is obtained; the sarsaparilla, vanilla and host of medicinal plants are characteristic of the Montaña. Fibrous plants abound and there is the greatest profusion of flowers, among them orchids, begonias and calceolarias, which are native here. In fact the Peruvian Montaña can show specimens of every tree and plant known to South American botany. The Sierra is said to be the original home of the potato, which is still found here in a wild state, but too bitter to be edible. The Sierra section is very rich in fodder grasses and has many of the familiar trees and plants of the temperate zones of other countries. The fauna of the Montaña includes the puma or cougar, the jaguar, the armadillo, the tapir, the peccary, the anteater and the manatee or sea-cow, and 30 species of monkeys, besides a great variety of small animals. Snakes, boas and vipers abound, and so do alligators and turtles. Parrots, flamingoes and a multitude of smaller tropical birds, butterflies, moths, beetles, flies and mosquitoes inhabit the forest. In the Sierra are found the characteristic group of wool-bearing animals: the llama, alpaca, guanaco and vicuña. The two former are domesticated; the other two roam wild, the guanaco in herds of 500 or more. The vicuña has been diminishing so rapidly that it is now protected by law. The fur-bearing chinchilla and several other rodents are denizens of the Sierra. The birds of this section are the familiar robins, flycatchers, finches and phœbes of the temperate zones, with partridges, ducks and geese, and the great condor of the Andes. In the coastal region there are lizards, scorpions and tarantulas. Seals visit the coast in large numbers and cod, haddock, mackerel, sole, plaice, flounder, smelt, lobsters and shrimp are plentiful in the coast waters. Among birds are the alcatras and gaviotas; and the gulls, terns and other marine species, in great numbers, frequent the small islands near the coast.

Agriculture.— Sugar is the most important crop grown and is cultivated mainly in the river valleys of the coastal section, chiefly in Lambayegue, Libertad and Lima. The largest sugar estates are in the Chicama and Cañete valleys. In 1916 the plantations covered 100,650 acres and gave employment to 23,456 persons, and the total production was 304,229 tons, of which 263,480 tons were exported. Cotton is cultivated on a large scale, the area in 1916 having been 139,087 acres. Several varieties are grown, but the main crop is of the Peruvian and the long staple Egyptian cotton. The former grows into a tree-like shrub, from 10 to 16 feet in height, begins to bear when eight months old and continues production for six years. The cotton area lies in Piura, Ica and Lima. Coffee is grown principally in central Peru, in the Chanchamayo and Perené districts of Junin and the Paucartambo district of Cuzco; the Huanaco district, and the Choguisongo and Carabay districts of Puno. Indian corn, which is indigenous to South America, thrives in all parts of Peru below the frigid table-lands. The district of Chancay alone produces annually 10,000 tons. Cacao grows wild in the Montaña and large plantations have been set out in Cuzco and Junin. The great native groves of rubber are on the eastern slopes of the Andes and in the region bordering the large rivers of the department of Loreto. The supply is so abundant that only one-hundredth part of the trees can be used. The rubber production amounts to more than 6,000,000 pounds annually. Coca is found wild in the forests, but there are also cultivated plantations, the largest in the Otuzco district. Cocaine is manufactured there and in Lima. Wheat, oats and barley are grown in perfection in the higher levels — between 5,000 and 11,500 feet elevation. Rice succeeds along the coast, principally in Lambay and the Pacasmayo valley in La Libertad. The annual production (1917) is over 46,000 tons. Grapes thrive in the coastal valleys, and there are several extensive vineyards where excellent wine is made. Olives also are of the finest quality and yield 30 per cent of oil, but are not largely grown. Other agricultural products are: Manioc, yams, tobacco, wax, honey, ramie, etc. Stock-raising, both of cattle and sheep, is carried on through the entire length of the country in the Sierra sections up to an elevation of 13,000 feet. Swine breeding is a considerable industry in the Chancay district. The wools of the alpaca, sheep and llama are grown for export as well as domestic use, the value of the exported wool reaching $2,500,000 a year. Other products of the stock-raising industry which add to the exports of the country are hides, goat skins, horns, parchment, tallow, lard and horsehair.

Mineral Resources.— A late report of the Department of Fomento (Development) of the Peruvian government contains the following interesting statement: "The chronicles of the discovery and exploitation of Peru's chief mining zones during the colonial epoch make the most important chapters in the history of that period. The development of this industry was stopped, first, by the abolition of compulsory Indian labor, and, secondly, by the revolt of the Indians and the prolonged war for national independence. . . . Later, the easy and sure ex-


COLOMBIA
ECUADOR
PERU
BRAZIL
EQUATOR
Quito
Guayaquil
Gulf of Guayaquil
Riobamba
Cuenca
Loja
Esmeraldas
Manabi
Tumbez
Piura
Payta
Chiclayo
Cajamarca
Chachapoyas
Moyobamba
Trujillo
Iquitos
Nauta
Tabatinga
Loreto
Pebas
Teffe
Amazon
Rio Negro
Rio Marañon
Rio Putumayo
Caqueta
Napo
Ucayali
Jurua
Purus
Madeira
Pampas del Sacramento
Puerto Chandless
Puerto Gibbon
Labrea
Chimborazo
Oriente
Orejones
Yahuas
Ticunas
Mayorhunas
Catuquinas
Xomanas
Meppuris
Pammarys
Cipos
Cocamas
Hypurinas
Quarunas
Pamanas
Caripunas
Espinos
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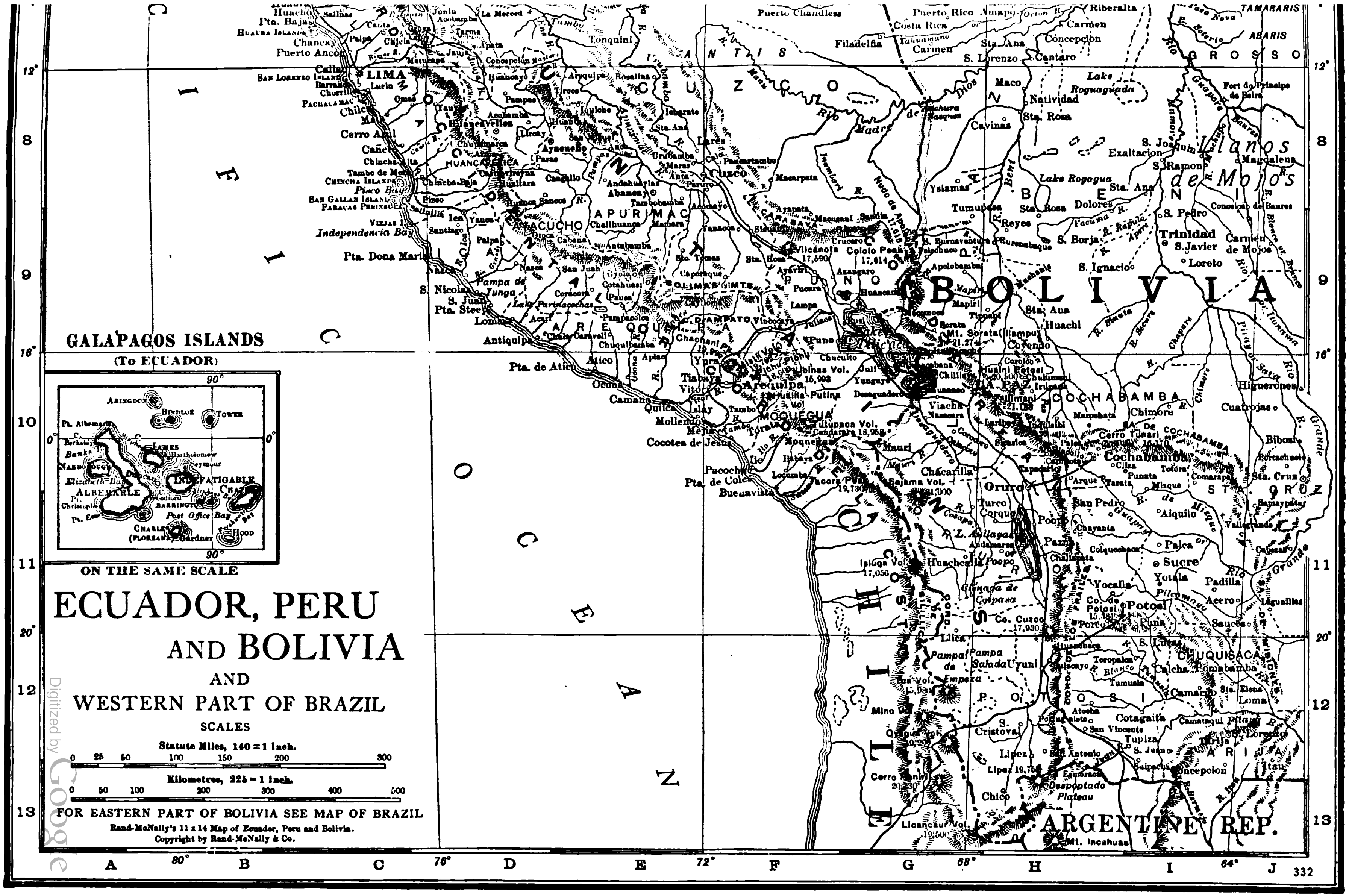

ECUADOR, PERU AND BOLIVIA

AND

WESTERN PART OF BRAZIL

SCALES

Statute Miles, 140 = 1 Inch.

0 25 50 100 150 200 300

Kilometres, 225 = 1 Inch.

0 50 100 200 300 400 500

FOR EASTERN PART OF BOLIVIA SEE MAP OF BRAZIL

Rand-McNally's 11 x 14 Map of Ecuador, Peru and Bolivia.

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ploitation of the fabulously rich guano deposits rendered it unnecessary to risk capital and spend energies in the hazardous and difficult mining industry. When the guano deposits began to be exhausted, the men who had been engaged in that industry turned their eyes toward the rich mineral deposits of Peru and resolved to encourage their exploitation. The founding of the School of Mines in 1876 and the passage of the Mining Law of January 1877, which made the holding of mining property perpetual and irrevocable (contrary to the practice under the old Spanish codes), caused a renewal of this great national industry. Even with the meagre development of the present, the mineral resources of Peru have been shown to be of remarkable variety and prodigious extent. The minerals which have begun to figure substantially in the export trade of the country are few in number. In 1916 the list included the following: Copper, 96,968,000 pounds; value, $24,000,000. Petroleum, 400,794 tons; value, $7,500,000. Silver, 11,835,168 fine ounces; value, $6,661,000. Vanadium ore, 3,801 tons; value, $1,380,000. Gold, 67,264 fine ounces; value, $1,239,000. Tungsten ore, 576 tons; value, $1,089,000. Coal, 320,000 long tons; value, $793,000. Lead, 2,246 tons; value, $156,000. There were also reported small values in antimony, molybdenum, zinc, quicksilver, borax and salt. Other minerals known to exist in considerable quantities are nickel, bismuth, cobalt, iron manganese, magnesium, graphite and sulphur. Besides these there are large deposits of marble, porphyry, jasper, jade, alabaster, gypsum and kaolin. Copper is found chiefly in the region from Cajamarca to Cuzco. The predominant ores are grey copper and iron pyrites, carrying percentages of both gold and silver. The largest smelter in the country is at Cerro de Pasco. It has a capacity of 500 tons of ore per day. Petroleum is found in quantity over a large area along the coast, in the province of Tumbes, and the department of Piura and Lambayeque. The most prolific districts at present are those of Talara and Lobitos. Silver is extremely abundant on the eastern slopes of the Andes throughout the whole Peruvian section. The most famous silver district is that of Cerro de Pasco, in Junin, which has produced since 1630, when the Spaniards took possession, about 50,000 tons of silver. The principal ores are oxides, sulphides, and argentiferous galena. The largest lode known in the country is that of Carahuaca. Vanadium is found abundantly near Cerro de Pasco. Gold is found chiefly in veins of ferruginous quartz, accompanied by silver and copper. It is also found in the form of nuggets, and scattered through alluvial deposits, particularly in the provinces of Sandia and Carabaya in Puno, and Quispicanchi in Cuzco. The lode mines have been practically neglected. Coal exists in Peru in vast quantities in all sections, and in all forms — anthracite, bituminous, lignite and peat. The fields being worked are in Ancachs, Huaigavoc and Cajamarca, but the total output is relatively insignificant. Lead is found plentifully in all the silver-bearing sections. Nickel exists in San Miguel and La Mar; bismuth in Junin; molybdenum in Jauja; cinabar in Huancavelica; borax in Arequipa, Moquegua, Tacna and Puno; and sulphur both in the coast region and in the Sierra. The guano diggings have diminished from the former prodigious output of 300,000 tons to about 60,000 tons per annum. The mining possibilities of the country are still practically undeveloped. While upwards of 10,000 mining claims are on record, only about 1,200 are being worked at all, and very few of these with any show of energy. The most serious obstacles to mining in Peru are the great altitudes at which the ores are found — 8,000 to 12,000 feet — and their inaccessibility owing to lack of railroad facilities.

Commerce and Manufactures.— The value of exports from Peru, as shown in the report of the department of finance, has increased steadily with slight fluctuations since 1897. For the year 1916 the exports were valued at $82,705,315 and the imports at $43,415,750. Before the War Great Britain's trade with Peru was much greater than that of any other country and in some years even greater than that of the United States, Germany and France combined. But these conditions are changed, and in 1916 the United States bought more than 60 per cent of the total of Peru's exports; and supplied nearly 60 per cent of her imports — about four times as much in both cases as any other country. The imports from the United States for the year ending 30 June 1916, were valued at $25,500,000; and exports to the United States at $52,000,000. The chief imports and their values in 1916 were: textiles of wool and cotton, $4,250,000; wheat, $3,350,000; lumber, $2,000,000; coal, $1,850,000; industrial oils, $1,500,000. The chief exports and their values were: copper, $28,915,685 (more than double the value for 1915); sugar, $19,362,725; cotton, $8,320,605; alpaca wool, $2,710,985; petroleum, $1,773,115. The largest manufacturing industries in the country are those of sugar and cocaine. High speed mills of the most approved type are replacing the older machinery in the sugar mills, with the result that 90 per cent of the sucrose of the cane is secured as compared with the old record of 75 per cent. The 30 cocaine factories of Peru supply the whole world's demand for the drug. Textiles are woven in five cotton mills in Lima, and in several other cotton and woolen mills in other sections. The annual output of the wine presses amounts to 2,500,000 gallons; considerable beer is made; and there is a large quantity of alcohol distilled. There are 20 rice mills throughout the country, and 20 mills where cottonseed oil and oilcake are produced. The manufacture and sale of tobacco was made a government monopoly in 1909, and the industry is conducted for the government by an organization with headquarters in Lima. The production in 1915 was 359,300,000 cigarettes, and 152,900 cigars; in which was consumed 1,340,000 pounds of domestic grown tobacco, and 178,000 pounds imported from Ecuador and Colombia. Other industries are the making of flour, macaroni and vermicelli; chocolate; paper; leather; boots and shoes and saddlery; «Panama» hats; furniture and chemicals.

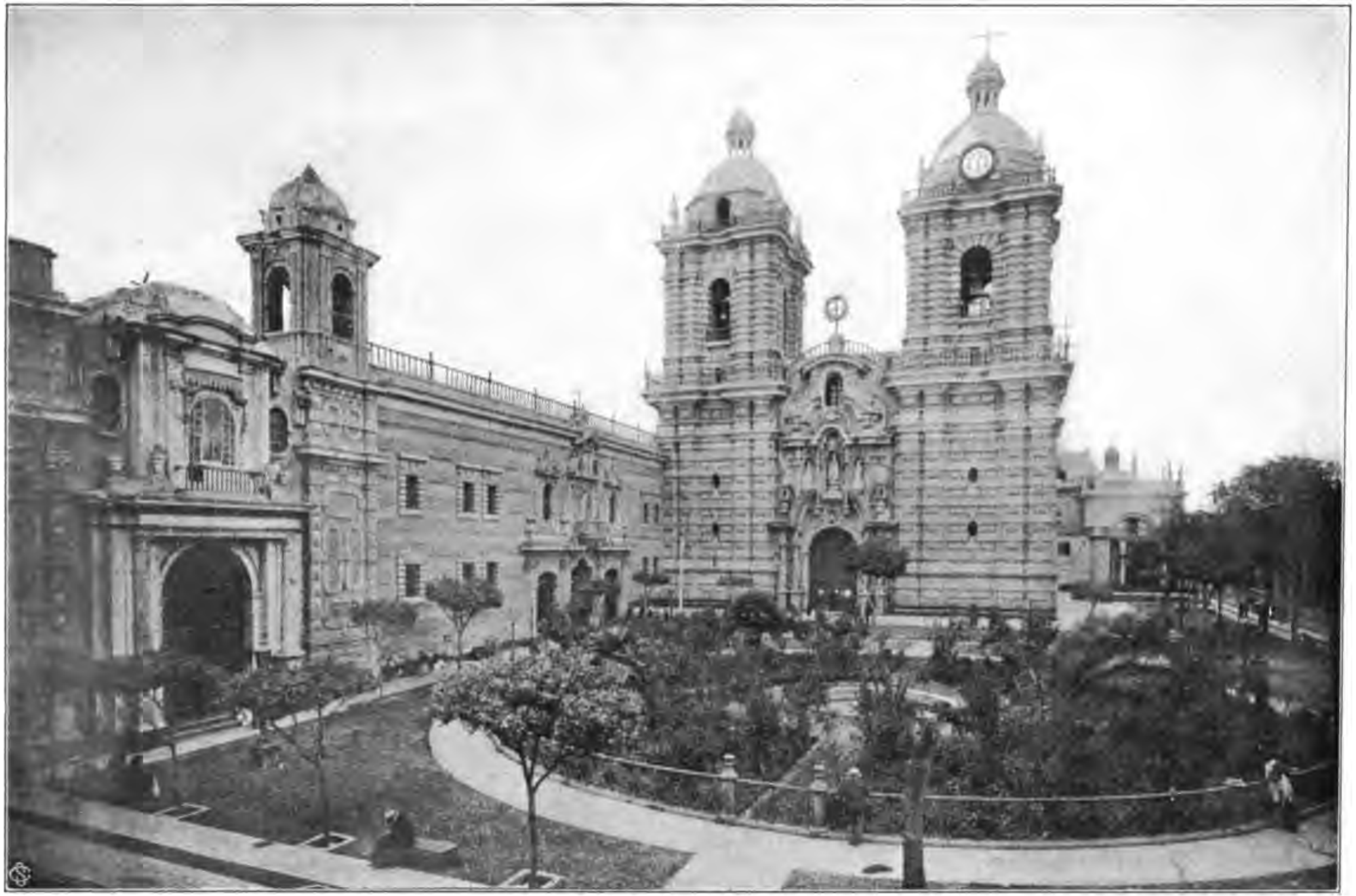
Navigation and Railways.— The chief port of Peru is Callao; Paita and Mollendo are also important as ports of foreign trade. There are a score of other Pacific towns which enjoy a coastwise steamship service. The Peruvian ports on the Marañon and Huallaga rivers in the east are connected by steamers with those of Brazil. In 1916 a total of 495 steamships aggregating 1,037,404 tons entered the ports of Peru. Of these 135 were Chilean; 117 British; 78 Peruvian; and 47 of the United States. The railways in 1916 totaled 1,724 miles; of which 1,117 miles were under control of the Peruvian Corporation (see the section *Finance*). The table below shows the proposed railways, many of which are already completed or under construction:

Pascamayo to Eten	65.160
Chocope to San Pedro de Lloc	52.306
Trujillo to Rio Santo	113.360
Menocucho to Queruvilca	80.600
Lima to Huacho	253.391
Lima to Pisco	246.040
Oroya to Yucayali	528.
Ayacucho to Cuzco	500.
Vitor to Siguao & Camani	198.
Ilo to La Joya	158.365
Cuzco to Santa Ana	185.
Total (kilometers)	2,380.12

Post Office and Telegraph.— In 1916 there were 646 post offices in Peru, and in that year they handled a total of 26,688,754 letters and packets. There were 252 telegraph offices, with 7,849 miles of line, and handling 1,707,000 telegrams in the year. Wireless stations were established at Iquitos, Masisca and Puerto Bermudez in 1908; at Callao, Pisco, Chala, Ilo, and Lima in 1913; and at Leticia, El Encanto and Orellana in 1916. In 1917 a high-power station was erected at Cachendo, near Arequipa. There are 182,900 miles of telephone wire. Iquitos, department of Loreto, has the advantage of regular service by direct freight and passenger steamers from New York and Europe. Other river ports are Yurimaguas on the Huallaga, and Contamana on the Ucayali. The chief Pacific ports are visited by vessels of the Chilean and Pacific Steam Navigation companies. The railroads, 1,718 miles in extent (1,300 miles standard gauge, including 30 miles of interurban electric lines, and the rest narrow gauge) are in large part owned by the government, and 65 per cent (1,120 miles) are operated, under arrangements of long standing, by the Peruvian Corporation (Ltd.), which owns and operates a line of steamers on Lake Titicaca, the railroad connecting that lake with La Paz, etc. The Central Railway climbs from sea-level at Callao to the altitude 15,666 feet on its way to Oroya, over 140 miles of track, and on a short branch line attains 15,865 feet. Its Huancayo extension has 78 miles of track. From Oroya a railway extends to Cerro de Pasco (see section *Mineral Resources*). The Southern Railway climbs from Mollendo on the Pacific Coast to Arequipa (altitude about 7,600 feet) and thence up to 14,666 feet at Crucero Alto and so to Puno on Lake Titicaca and, by the Juliaca and Sicuani branch, to Cuzco. The Pan-American Union handbook *Chile* contains the statement that, beside the Central and Southern, the Peruvian Corporation also operates six other railroads in Peru, as follows: Paita to Piura Railway; the Trujillo Railway; the Pascamayo and Guadalupe Railway; the Chimbote, the Pisco to Ica, and the Ilo to Moquegua railways. These, and other short lines, serve portions of the littoral. In 1917 the government authorized the departmental board of Ancachs to construct an automobile road between the port of Casma and the city of Huaraz. The Department is authorized to contract a loan of 40,000 Peruvian pounds (pound =$4.8665), with interest and amortization not to exceed 10 per cent annually. The loan will be guaranteed by a small tax on freight transported over the road and by a yearly appropriation of $2,000 in the departmental budget: The government has adopted recently a scheme of road building to apply to all parts of the republic. Roads are classified in four groups — national, departmental, provincial and district, according to the authority in charge of construction. For the national roads a staff of road engineers is organized and provided for in the annual budget. Roads from Andamayo to Ayo, San Miguel to Mount Pucamarca, and from La Mergerada to Luricocha are already under construction.

Weights and Measures.— The Peruvian *libra*=1,0143 pounds; *quintal*=101.44 pounds; *arroba*=6.7 gallons; *vara*=0.927 yard; the *square vara*=0.835 square yard. The metric system was formally adopted many years ago but was not put into operation until September 1916, and then only in Lima and Callao. It is official in all tariff applications. Congress passed a law 14 Dec. 1901, providing for the adoption of the gold standard on 1 March 1903. The Peruvian gold pound, or *libra* (equivalent to the British pound sterling), is the basis of the coinage. Silver is legal tender for all sums up to 100 soles (*sol*=$0.487). The statement was officially made in August 1903 that "Ten silver *soles* are accepted and paid by the banks as the equivalent of the Peruvian or British pound sterling." The silver coins are the sol, half-sol, 1-5 sol, 1-10 sol and 1-20 sol. There are one-centavo and two-centavo bronze coins — 100 centavos=one sol. Paper money is issued in one-sol, five-sol, one-libra, five-libra and 10-libra notes.

Government.—While in its main features the government resembles that of the United States, the differences are important. Thus, Congress consists of a Senate and House of Representatives, but Senators as well as deputies are chosen by direct popular vote, and the number of Senators representing each department in the national legislature is not invariably two, but from one to four, the larger number being conceded to departments which contain more than eight provinces. In 1918 the Senate had 52 members and the House 116 members. Every second year one-third of the members of each chamber are retired, the selection being made by drawing lots. The President is chosen by direct popular vote for four years, but he cannot serve for two successive terms; and, to provide for such contingencies as the death or disability of the chief executive, two vice-presidents are elected in the same manner. The executive appoints a cabinet of six ministers, removable at his pleasure. Official acts of the President require for their validity the signature of a member of his cabinet (compare PARAGUAY), the cabinet ministers being severally in charge of the departments of Foreign Affairs, War and Marine, Interior, Finance and Public Works, Justice and Worship and Instruction. The departments are divided into provinces (102 in all), each of which is administered by a prefect. The provinces are subdivided into districts (850 in all), each governed by a sub-prefect. The Supreme Court sits at Lima, and is composed of 11 judges. The country is divided into 10 judicial districts for which superior and minor courts are provided. The choice of Supreme



San Francisco Church and Convent, Lima

PERU

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1 The University at Cuzco

2 Bridge over Rimac River at Lima

Court judges depends upon Congress and the executive; the latter selects judges of the lower courts from lists of candidates proposed by the higher tribunals.

Finance.— The improvement in the financial policy of the country during recent years has been marked. A syndicate for the collection of taxes began operation in April 1913, advancing as a loan the sum of $6,225,000. The chief sources of revenue are customs, taxes, the salt and tobacco monopolies, posts and telegraphs, alcohol, opium, stamped paper, legacy and property transfers, etc. The expenditures are chiefly for the Bureau of War, Bureau of Finance, the Home Office, the Bureau of Justice and Instruction and the Bureau of Fomento. The revenues for the year ending 31 May 1916 were $19,711,915, and the expenditures were $15,968,045, showing a surplus of $3,743,870. The estimated revenue for 1918 amounted to $19,878,050. The foreign debt, consisting of loans contracted in England and large arrears of interest at the beginning of 1890 amounted to £54,577,731. Railways, and certain rights over mines and lands, were ceded to the Peruvian Corporation, a foreign company representing the bondholders, for a period of 66 years, as the only feasible method of obtaining relief. As neither party to this contract fulfilled the obligations, the agreement was nullified, and in 1907 the Peruvian government began under a new contract to pay 80,000 libras per year for 30 years to the corporation. The latter completed certain railroad construction from which the government receives half the net receipts, and the lease of the corporation was extended 17 years — to 1921. Peru's total public debt in 1916 amounted to 6,983,010 libras ($31,423,545).

Revenue and Banking System.— The delegation of Peru to the First Pan-American Financial Conference called attention to the increase in national revenue during the 17 years from 1896 (when the amount was $5,643,570) to 1913 (when the amount was $17,089,870); somewhat more, therefore, than 300 per cent. As chief sources of revenue we mention the Pacific Coast customhouses, tobacco monopoly, tax on spirits and salt monopoly. There was a marked falling off in the public revenues after the exporting and importing nations of Europe became involved in war; and this, in so far as it had not been met by a proportional reduction in the government's expenses, led directly to a situation fairly obliging the government to adopt plans for the protection of banks and private debtors (this includes the moratorium) and for a budget of reasonable proportions; it led also to that substitution of paper for metallic currency mentioned in the foregoing paragraph. The collection of taxes, with a single exception to be noted, is delegated to a joint-stock company called the National Tax Collecting Company (capital $1,500,000) which charges 1 per cent on the revenue from general taxes, 6 per cent for collecting license fees in the capital and at Callao and 10 per cent for the administration of the piers at Tumbes, Supe and Chala. The exceptional collecting agency just referred to is the National Salt Company, another joint-stock and fiscal organization: to it the government delegates control of all the salt mines and deposits of salt in Peru. The distinguished authors of the memorandum we cite said that the national debt was $28,932,286, which shows, according to the accepted estimate of the number of inhabitants, a per capita debt of only $6.42 or $6.43. The banks mentioned were the Banco del Perú y Londres (paid-up capital $2,500,000 and reserve fund $1,500,000); Banco Internacional (authorized capital $2,500,000, paid-up capital $500,000, and reserve fund $125,000); Banco Popular (authorized capital $1,000,000, paid-up capital $750,000, cash reserve fund $310,000); Banco Italiano (paid-up capital $1,000,000, reserve fund $446,650, sinking fund $75,000); Banco Alemán Transatlantico (a branch for transactions in Peru, $1,000,000). The Commercial Code of Peru prescribes for foreign associations wishing to establish banks in this country (paragraph 11, article 21 and article 185) that they "shall produce and enter in the register a certificate issued by the Peruvian consul that they are constituted and authorized in accordance with the laws of the respective countries, in addition to their constitution and the documents required for Peruvian associations. . . . All banks must have in their vaults at least one-fourth in sterling of the amount of their indebtedness to the public." Banks must pay, "for inscription," or as initiation-fee, from one-fourth to one-half per thousand, calculated on the amount of the declared capital, and 5 per cent on the net earnings. The banking institutions of special and distinctive characteristics, to be added to the foregoing list, are the Peruvian clearing house (Banco de Depósitos y Consignaciones, capital $500,000 subscribed by Peruvian banks), W. R. Grace and Company, and the Lima Savings Bank (Caja de Ahorros, capital $100,000 and over $1,000,000 in deposits).

Army and Navy.— Military service is universal and compulsory: three years in the active army, and 27 years in the three reserves. The peace army consists of 6,500 officers and men. There is also a semi-military state police, a body of 5,074 men, of whom 1,886 are mounted. The navy numbers seven vessels: an armored cruiser of 6,400 tons; two cruisers of 3,200 tons, and one of 1,700 tons; two submarines; and one torpedo-boat destroyer. There is also a fleet of seven small government boats on the Amazon.

Population.— Though the Quichua language is still spoken by a majority of the people of Peru (of whom 57.6 per cent are classed as Indians and 24.8 per cent mestizos), this linguistic unity by no means implies uniform characteristics; on the contrary, it is necessary to regard the present Indian population as descendants of many different native races of varying degrees of natural intelligence and physical vigor, the common tongue having been imposed by the conquering Inca tribe. Some of the Indians of to-day are found to be progressive — at least sufficiently so to encourage the hope that they may, little by little, become useful citizens in a civilized country; but other descendants of the aborigines seem utterly incapable and irresponsible. The negro and Asiatic elements are small; the white element 13 per cent.

Education and Religion.— The most ancient university in the New World, that of San Marcos at Lima, was founded in 1551; the university at Cuzco in 1598; the college at Arequipa in 1616. There are also a university at Trujillo, a school of mines and engineering at Lima, a school of arts and trades, a military school, a naval school, and a school of agriculture. Like the neighboring republic of Ecuador (q.v.), Peru has been honored by the achievements of her historians and geographers, the Paz Soldans and others; writers on constitutional and legal subjects; poets and dramatists (comedies by Segura, etc.); and such naturalists as Rivero and Pinerola. Elementary education is compulsory for both sexes, but the law has never been enforced. Instruction is free in the public schools. In the government high schools, one of which is maintained at each of the capital cities of the departments, a small fee is required. The number of primary schools in 1916 was 2,296, with 3,304 teachers and 166,002 pupils. There were also 277 students in the normal schools; 5,202 in the high schools; and 1,791 at the universities. The Roman Catholic bishopric of Cuzco was founded in 1537, and the see of Lima in 1541. The provisions of the constitution and laws in regard to worship recognize only Roman Catholicism as the religion of the state, although other religions are tolerated as a social custom. All churches and convents belong to the state, and the government appropriates annually about $80,000 for the maintenance of public worship.

History.— Before the coming of the Spaniards, the Sierra was held by Indians of the Inca tribe whose chief town was Cuzco. Chiefs of that tribe, «Incas» *par excellence*, had extended their conquests along the heights of the Andes, northward somewhat beyond Quito and southward into the Titicaca Basin. Unquestionably, also, they held in subjection tribes of the Pacific Littoral and Montaña regions; their commanding position, relatively efficient military organization, and use of the llama on long marches, enabling them to levy, even in remote communities, a tribute of «sun virgins» (female captives, who were assigned to the service of the national god), and of the precious metals, which were largely used, never as money, but for the interior decoration of temples and for domestic utensils. As for the social organization of the Incas, and the impressive accounts of the so-called dynasty which have been commonly accepted hitherto, it must be admitted that recent scientific researches conducted in the Sierra have put the whole subject in doubt. It is quite certain, for example, that the «empire» was ruled, not by a succession of enlightened administrators, but by war-chiefs, whose office was not hereditary; that extravagant notions have prevailed in regard to the defenses of the capital, the system of roads and the irrigation works; and that a reliable chronology begins with the Spanish conquest. On 14 Nov. 1524 Pizarro first sailed from Panamá. About three years later the Inca Huayna Coapac died, and a civil war broke out between north and south, Atahualpa commanding in the former section, Huascar in the latter. This disruption proved to be the Spaniards' opportunity. In January 1530 Pizarro again sailed from Panamá, and, after long delays, reached the Sierra. On 16 Nov. 1532 the Spanish force seized and imprisoned Atahualpa. Xeres, Pizarro's secretary, writes: «Atabaliba (Atahualpa) feared that the Spaniards would kill him, so he told the governor that he would give his captors a great quantity of gold and silver. The governor asked him: ‹How much can you give, and in what time?› Atabaliba said: «I will give gold enough to fill a room 22 feet long and 17 wide, up to a white line which is half way up the wall.» The height would be that of a man's stature and a half. He said that, up to that mark, he would fill the room with different kinds of golden vessels, such as jars, pots, vases, besides lumps and other pieces. As for silver, he said he would fill the whole chamber with it twice over. He undertook to do this in two months.» February 1533 Almagro arrived; 3 May 1533 the gold and silver were melted; 29 Aug. 1533 Atahualpa was garroted. On 6 Jan. 1535 the site of Lima was chosen; the city founded 12 days later. On 8 April 1537 Almagro seized Cuzco; 8 July 1538 he was condemned to death. Two years afterward, Gonzalo Pizarro started to explore the Montaña; Sunday, 26 June 1541, Francisco Pizarro was assassinated. June 1542 Gonzalo Pizarro returned to Quito. From 28 Oct. 1745 to February 1746, earthquakes occurred destroying Callao; 1780 to July 1783, Tupac Amaru, descendant of the Incas, rebelled; 3 Aug. 1814 the cry of independence was raised at Cuzco; September 1820, the Argentine general, San Martin, landed on the coast of Peru, Lord Cochrane and English officers accompanying him from Chile (q.v.); 28 July 1821, independence was proclaimed at Lima, after San Martin's entrance; 20 Sept. 1822, San Martin resigned protectorate; 1 Sept. 1823, Bolivar arrived at Lima; 6 Aug. and 9 Dec. 1824 the Spanish forces were defeated at battles of Junin and Ayacucho; 24 Aug. 1827, General Lamar elected to the presidency; 16 Oct. 1856 the existing constitution was framed, and 25 Nov. 1860 revised; 2 May 1866 a Spanish fleet, sent to enforce alleged claims, was repulsed at Callao; 13 Aug. 1868 and 9 May 1877 destructive earthquakes occurred; 5 April 1879 Chile declared war against Peru; 8 Oct. 1879 the Huascar was captured by Chilean ironclads; 17 Nov. 1879 battle of Tarapacá, the Peruvian province of that name falling into the hands of the Chileans; 26 May 1880, battle of Tacna; 7 June 1880, Chileans captured the port of Arica; the Peruvian army was nearly annihilated; Chilean ships desolated the whole coast; 13 and 15 Jan. 1881, Chilean invading force defeated Peruvians at Chorrillos and Miraflores; 17 Jan 1881, Chileans entered Lima; 20 Oct. 1883, a treaty was signed, ceding Tarapacá to Chile, and providing for the occupation of Tacna and Arica by the Chileans for 10 years, at the end of which period the inhabitants should determine by vote whether they would belong to Chile or Peru. But it was also provided that the nation preferred by the voters should pay $10,000,000 to the other nation; and when the time arrived for holding the plebiscite, Peru was unable to give attention to the matter and unprepared to pay the stipulated sum, in the event of a favorable decision. On 25 Nov. 1901 an agreement was made with Bolivia for the settlement of the boundary disputes by arbitration. In September 1903 Manuel Cándamo was inaugurated President but he died in May 1904 and was succeeded temporarily by Señor Calderon, the Second Vice-President, as the First Vice-President had also died. Elections were immediately held and José Pardo was chosen President and installed in September 1904. On 24 Sept. 1908 Augusto B. Leguía was inaugurated President. On 29 May 1909 President Leguía and several members of the Cabinet were captured by a band of desperate men in an attempt to overthrow the government. After being paraded through the streets of Lima and threatened with death if he did not resign, Leguía was rescued by the loyal troops and the conspirators captured or put to flight.

In 1912 the Chilean occupation or tenancy of Tacna and Arica was confirmed, in perpetuity, by agreement between the two countries. On 6 Dec. 1914 a severe earthquake in the department of Ayacucho killed a number of people and destroyed many buildings. In 1915 important archæological studies were made by an expedition under the auspices of Yale University and the National Geographic Society (of Washington); the excavation of the large ruins of Patallacta at Qquente was carried on with care, although seriously hampered by unfriendly action on the part of the Historical Institute of Cuzco; and, before the reconnaissance work was stopped by the government, addition was made to the new learning in regard to the region of the Machu Picchu ruins. In February 1914 Colonel Benavides led a military uprising against President Billinghurst who was accused of autocratic methods of government. The movement resulted in the exile of Billinghurst and a provisional government was set up with Benavides at the head. During that year Provisional President Benavides, «as a reply to the charges that he desired to establish a dictatorship,» issued a call for an election; his candidate was defeated; Dr. José Pardo, coalition candidate, was elected; and Benavides was accused, in charges presented to Congress, «of abuse of power, the assassination of General Varela, treason, rebellion against the government of Billinghurst, securing loans without previous consent of Congress and amassing wealth while in office.» Congress ordered an investigation. The same body approved, in October, a constitutional amendment guaranteeing religious liberty; but President Pardo refused to sanction or to veto that progressive measure (see *Education and Religion*), and upon its promulgation by Congress a demonstration of hostility was made in the streets of the capital.

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MARRION WILCOX.

PERUGIA, pā-roo'ją, Italy, (1) a city, capital of the province of the same name, on the side and summit of a lofty eminence washed by the Tiber, 84 miles north of Rome. It is surrounded by lofty walls, and defended by a citadel; has irregular but spacious streets, and many remarkably handsome buildings. Among its edifices are the unfinished cathedral, a bold Gothic edifice of the 15th century, possessed of a valuable library rich in works and manuscripts connected with biblical literature; the church of Saint Agnese, adorned with frescoes by Perugino and his pupils; the oratory of San Bernardino, with a magnificent façade in which colored marble and terra-cotta are employed; the convent of San Severo, now a college, containing the first fresco painted by Raphael; the church of San Pietro de Cassinensi, dating from the 10th century, with a roof supported by marble and granite pillars taken from a heathen temple, and so rich in pictures as almost of itself to form a gallery; the 13th century church of San Domenico, with some fine monuments; the Palazza Pubblico or town-hall, a majestic edifice of the 13th century, containing the valuable Vannucci picture-gallery and a library of 77,000 volumes; the Collegio del Cambio or Exchange, no longer required for that purpose but interesting from the number of fine frescoes with which Perugino has covered its walls; the prefecture, a handsome modern building; a fine public fountain; the arch of Augustus, a fine ancient gate, built of massive blocks of travertine without cement. Perugia possesses a free university, founded in 1320, with about 270 students, a library of some 54,000 volumes, a museum of antiquities, a botanical garden, etc. The manufactures, comparatively unimportant, consist of velvet, silk stuffs, brandy, etc. The trade is in grain, oil, wool, spun silk and cattle. Perugia (then known as Perusia) under the Romans and in pre-Roman times was one of the 12 principal cities of Etruria, and remains of the ancient necropolis with the tomb of the Volumnii, discovered in 1480, are to be seen three miles southeast of the city. Having taken the part of Mark Anthony in the war between him and Augustus, Perugia was sacked. In the 6th century, Totilla, one of the northern barbarians, took it after a siege of seven years, and put many of its inhabitants to the sword. Pepin le Bref, king of France, took Perugia in the 8th century, and made a present of it to the Pope. It suffered much during the contests between the Guelfs and Ghibellines, and both in the 14th and 15th centuries was fearfully ravaged by the plague. It was joined to the papal states in the middle of the 16th century. The Sardinians annexed it to what is now the kingdom of Italy in 1860. The celebrated painter, Pietro Vannucci or Perugino (q.v.), though born in Citta della Pieve, long made Perugia his adopted home, and died in it a victim of the plague in 1524. Pop. about 66,000. (2) The province of Perugia or Umbria has an area of 3,748 square miles. It is traversed in all directions by offsets of the Apennines. The principal stream is the Tiber. The soil is fertile, producing in abundance corn, wine, fruits, oil and silk. Pop. about 686,000. (See UMBRIA). (3) The Lago di Perugia, is about 10 miles long, by eight in breadth, and surrounded with olive plantations. It contains three islands — Isola Maggiore, Isola Minore and Isola Polvese; and abounds in fish. It appears to have no natural outlet, and its shores used to be often overflowed, but this was remedied by an artificial outlet opened in 1896. Hannibal gained a signal victory over the Romans near this lake in 217 B.C., as related by Livy (XXII, 3-6). (See HANNIBAL). Consult Cruikshank, 'The Umbrian Towns' (1901); Heywood, W., 'History of Perugia' (New York 1910); Symonds and Duff-Gordon, 'The Story of Perugia' (London 1900).

PERUGINO, pā-roo-jē'nō, easel name of PIETRO CRISTOFORO VANNUCCI, Italian painter: b. Cittá della Pieve, near Perugia, 1446; d. Castello di Fontignano, near Perugia, 1524. It is quite probable from indications in his early painting that Fiorenzo di Lorenzo was his teacher, while according to Vasari he completed his studies under Verrocchio at Florence, was a fellow-pupil of Leonardo da Vinci (1475) and gained much skill in tempera painting, though he was subsequently among the first Italians to use oil as a vehicle. In 1475 he painted frescoes in the town-hall of Perugia. He worked for Sixtus IV in the decoration of the Sistine Chapel, where his 'Christ Delivering the Keys to Peter' and 'Baptism of Christ' are still admired (1483-86). At Perugia to which city he finally returned and where he took up his residence, Raphael, then a boy of 12, became his pupil. His first easel pictures, two Madonnas, are now one in the Louvre, the other in the English National Gallery, and exhibit that tenderness and grace, yet strength of expression, which belong to all his works. While his earlier pictures belong to the Quattro-cento style his latter productions show the influence of Michelangelo and Leonardo, exponents of the Cinque-cento style. Among his best pictures, which he executed in the latter manner (1490-1505), is 'The Marriage of the Virgin,' now in the museum at Caen, and widely known through the Arundel print reproduction. This work, however, has recently been attributed to Lo Spagna. To the same period belong 'The Ascension of Christ' in the museum at Lyons, which is one of his masterpieces, combining strength of composition with intense religious feeling; and 'The Assumption of Saint Mary the Virgin' for the Church of Santa Maria Maddalena de Pazzi at Florence. Among his last works were the 'Martyrdom of Saint Sebastian'; 'The Baptism of Christ'; 'The Transfiguration'; and 'The Birth of Christ' in the church at Fontignano. It was after completing this picture that he was struck with the plague from which he never recovered. He was a prolific and industrious artist, and even during his lifetime foreign merchants carried his pictures into every country of Europe, where they are to be found in all the great public and many private collections. He made a really original departure in Italian art, and molded the style of Raphael in its early stages, though the latter quickly developed a manner and spirit preeminently his own.

PERUVIAN ANTIQUITIES. See PERUVIAN ARCHÆOLOGY.

PERUVIAN ARCHÆOLOGY. During the pre-Incaic and Incaic periods ancestor-worship, hero-worship and sun-worship all exerted a remarkable degree of influence in the Andean highlands. We may appreciate the effect of ancestor-worship in the remote past if we give attention to the fact that even today the most important article of the simple faith of one of the native races is that human beings are transformed into Achachilas after death. Now, these Achachilas are, according to the belief of the natives, powerful spirits or demons living in every mountain, every lake, meadow and stream, and exerting most active influence in control of the lives and fortunes of men — to such an extent, indeed, that no important undertaking is begun until the Achachilas of the neighborhood have been propitiated by symbolic offerings. With similar motives, so far as we may judge, in prehistoric times every effort was made to express by means of burial customs the belief in what may be roughly described as immortality on earth. Thus, for example, offerings of the products of industry and of art were placed near the mummified body in its burial cave to express firm assurance that the ancestor still continued his conscious participation in the activities of his descendants; and it is obvious that such objects as these supply the archæologist with trustworthy data.

Again, we may at least begin to appreciate the driving force of hero-worship and sun-worship if we give attention for a moment to a tradition that deals not only with one of the most heroic of Inca rulers but also with the extremely interesting Temple of the Sun at Cuzco, that famous mountain-built city which was the capital of the Inca tribe and nation before the Spanish conquest of Peru.

The descriptions one may still hear if one talks with educated Cuzqueños about the egregious symbolism of the interior decoration of the principal temple are certainly fancy-stirring. In pre-Columbian times the high altar, which faced the east, held the «effigy» of the sun, which was made of gold encrusted with precious stones.* The walls also were covered with gold wrought in various shapes. Seated in a semi-circle on their thrones, right and left from the image of the god, were the mummies of the «children of the sun,» the Inca chiefs, ranged in the order of their succession, from Manco Ccápac to Huayna Ccápac. Light was admitted through a single aperture, in the eastern wall, so situated that when the sun rose to a certain height its rays pierced the obscurity and fell upon its own image, which then suddenly, with glow of gold and gleam of emeralds, illuminated this chamber «long to quiet vow'd.» It is said that the face of every other enthroned Inca was averted reverently from the god, but the corpse of Huayna Ccápac had been placed in the attitude of fearless scrutiny; and this for the reason that in his lifetime he claimed that his own power was absolute, while even the freedom of action of the god was limited. One day (so the story goes) when a religious ceremony was being performed in the great square of Cuzco, Huayna Ccápac looked up at the sun in the zenith, staring at it so fixedly that the high priest remonstrated: «Do you forget, son of the sun though you are, that the law of our religion forbids even you to gaze on him impiously?» «You are right about the law,» replied the chief, «but consider the facts. Do you believe anyone could oblige me to do a thing contrary to my free choice?» «Impossible!» the high priest exclaimed. «Now listen,» continued the Inca. «This sun does the same thing day after day, always rising in one quarter, always going down in another, and holding one course unalterably. Why? Because he is not his own master. He is commanded to do it. Therefore he is not and cannot be god.» It seems probable that the superstitious and patient native laborers of an earlier day accomplished the most difficult tasks (the ancient faith being then unshaken) under twofold inspiration; that when they built a great stone fortress, palace or temple they did the work as servants of the life-giving god of all the people and as subjects of some scarcely less revered ruling family, conspicuous members of which were regarded as intermediate in nature between gods and men. This seems to be true especially when we study architectural remains of the pre-Incaic or megalithic period.

These megalithic, pre-Incaic monuments are found in many parts of the Peruvian and adjacent Bolivian highlands, and are generally regarded as works of a superior native race which, after being from earliest times the dominant factor in the population of the best portions of that whole region, had the misfortune to be overcome, and ultimately to a large extent exterminated, by savage invaders about the time of Christ. Professor Bingham (see *Bibliography*) writes in *Harper's Magazine:* «Sir Clements Markham in his book on the Incas of Peru devotes a chapter to a myth which was told to all the Spanish chroniclers by their native informants, which he believes is the fabulous version of a distant historical event.» The gist of the native informants' accounts was that people of the early megalithic period were conquered by a great incursion from the south. The whole country broke up into anarchy, and savagery returned, ushering in a period of mediæval barbarism. Remnants of the megalithic folk took refuge in a district called Tamputocco (or Tampu Tocco) where they were protected from the invaders by the inaccessible character of the country. Here the fugitives multiplied. Their descendants, more progressive and powerful than their neighbors, «in time became crowded, and started out to acquire a better and more extensive territory. The legend relates that out of a hill with three openings or windows there came three tribes. These tribes eventually settled at Cuzco and founded the Inca empire.»

At Tiahuanaco the groups of megalithic ruins are called by local scholars simply the «monumentos prehistóricos» and the city which occupied this site is commonly assigned to a remote period antedating changes traditionally reported (compare second part of Cieza de León's Crónica del Perú) to have occurred in the topography and climate of the high plain of Peru and Bolivia at this point. Thus, a South American author says that the construction of an edifice which he calls the «palace» shows clearly that the climate at the time when this building was erected must have been positively warm; that it was «benignant» then because this Andean plain had not attained its present altitude, and the inhabitants were able to devote themselves to such gigantic works as these which excite our wonder at Tiahuanaco because climatological conditions in those days favored the development of a large agricultural and industrial community; that Lake Titicaca occupied a larger part of the high plain, and Tiahuanaco was an island. The view he has expressed, to the effect that the region in question was much lower and less bleak when Tiahuanaco was built, is one that is commonly shared by travelers who study the ruined city at all carefully. Sir Clements Markham, in an address published in the *Geographical Journal*, says: «Some miles from the southern shores of Lake Titicaca, once actually on the shore, there are the ruins of a great city, now called Tiahuanacu. (There is good authority for spelling the name either Tiahuanaco or Tiahuanacu). In the time of the Incas it was the same ruin as it is now, its origin and history absolutely unknown, and myths were invented to account for the numerous stone statues. The ruins show very advanced proficiency in the masonic art, and there are monoliths which have been conveyed from great distances. The size of these cut and carved stones is unequaled in any other part of the world except Egypt. There must necessarily have been a very large population and an immense food supply. But at the present time we observe that corn will not ripen in this neighborhood, because the climate is too rigorous. The question how a region where corn will not ripen can have been selected as a site for a great city is a problem which seems well worthy of study.» A discussion which arose after the reading of that address related chiefly to the rather startling suggestion that the Andes have risen 1,000 feet in height since certain stone remains were deposited at Tiahuanaco by man, as the president of the Royal Geographical Society, Maj. Leonard Darwin, expressed it. Continuing, the president said: «In considering this question, what we should like to know in the first place is, what is the age of these ancient ruins? . . . Judging by the age now generally assigned to the pyramids of Egypt, it would not be an outrageous supposition to suggest that these megalithic remains may be 4,000 years old.» Sir Martin Conway said that observations he himself had made in the same upper region led him to conclusions not at variance with those expressed by the other members.

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* According to early Spanish accounts, a conventionalized discoidal representation.

One consideration which was not mentioned during that discussion at the Royal Geographical Society has, we think, direct bearing upon the problem. When the writer walked over the fields near the famous «artificial hill,» noticing how great the distances are between vestiges of old Tiahuanaco on the north and south sides of the valley, and paying attention to the evidences of vast and exceedingly laborious undertakings, it seemed obvious that we must take into account the rarefaction of the air which, at an altitude of 12,500–12,600 feet occasions a more or less clearly marked aversion to long-sustained physical effort. If we forget all we have ever read about the place, and simply let the monuments tell their own story, we are quite certain to receive an impression predisposing us to favor the view that blocks of stone of such enormous size (and one brown-red slab that we measured in the Puma-Puncu district of Tiahuanaco was more than 27 feet long, 18 feet wide and from three to six feet thick) were quarried at Andamarca de Quimzachata or still more remote places and brought to this point before the plain had been uplifted above the present level of Cuzco.

Recent discoveries made by the Yale Peruvian expedition supply a connecting link between the builders of Tiahuanaco and the Incas. The leader of that expedition believes the place now called Machu Picchu «to have been the original Tampu Tocco, from which the Incas came when they started on that migration which led them to conquer Cuzco and to establish the Inca empire»; and it seems almost certain that the investigations carried on at Machu Picchu since 1911 shed light on the pre-Incaic as well as the Incaic periods. Professor Bingham claims for Machu Picchu a superiority in extent and interest over previously discovered Incaic ruins, saying that those in the city of Cuzco and on the islands of Lake Titicaca, the town and fortress of Ollantaytambo, Pisac, Ancón (near Callao), Pachacamác, Nazca, Trujillo, Vitcos and the country of the grand Chimu, «where the chief interest lies in the extensive findings of mummies, pottery, textiles and metal ornaments, including gold, silver, bronze, etc.,» were known to the Spanish conquerors and have been despoiled by treasure-hunters. On the other hand, Machu Picchu, which is larger and contains more edifices than any other ruin discovered in Peru (except Cuzco), was not known to the early Spaniards, was not occupied by their descendants, and, not having been the treasure-hunter's prey, survives to-day in a remarkably good state of preservation. It is found that the ancient inhabitants of Machu Picchu were, like the citizens of Tiahuanaco, masters of the art of cutting and handling great blocks of stone. Thus, a single piece of granite in the east wall of the chief temple on the sacred plaza at Machu Picchu measures 13½ feet in length and nearly eight feet in height. The builders of Machu Picchu knew how to make bronze; their pottery is varied in form; they understood how to plan and accomplish great architectural and engineering works; they utilized for intensive agriculture (on the patiently constructed *andenes*, or terraces) every square yard of available land within a radius of several miles; ignorant of writing, they employed small stone discs which «seem to be pre-Inca and may have been used to keep the records of Tampu Tocco before the discovery of the *quipu*, or knotted string»; and they divided their city into wards or clan groups, each ward having but one entrance, a gateway that could be securely closed. Dr. Eaton, the osteologist of the Peruvian expedition of 1912 under the auspices of Yale University and the National Geographic Society, writes in regard to Machu Picchu burial customs: «In only a few instances were the remains actually *inhumed*, that is, entirely covered with earth. The large majority of burials were made in caves, where the remains would be well protected from moisture and sunlight. When skeletal material was obtained from such sheltered places there were usually indications that the greater part of each mummy or body had been originally left above ground. I think that whenever there was sufficient head-room, the mummies were placed sitting in the contracted position.» See also the article INCA SEMI-CIVILIZATION.

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PERUVIAN BARK. See BARK, PERUVIAN; CINCHONA.

PERUZZI, pā-root'sē, **Baldassare,** Italian painter and architect: b. Accajano, near Siena, 1481; d. Rome, 6 Jan. 1536. He settled in 1503 in Rome, where he began a study of the antique. He painted in the church of Santa Croce in Gerusalemme and designed the Villa Farnesina (1509–16). In 1520 he succeeded Raphael in the construction of Saint Peter's, changing Bramante's plan from a Latin into a Greek cross. This design, however, was not carried out. From 1527, when he was made architect to the city of Siena, he built many palaces there. He was again busy with Saint Peter's and Roman palaces from 1530. Of his paintings special mention should be given to his fresco of the 'Sibyl Proclaiming to the Emperor Augustus the Coming of Christ,' in the Fontegiusta Church of Siena. Consult the study by Redtenbacher (1877).

PERVIGILIUM VENERIS, the Vigil of Venus, a short Latin poem of 93 lines, of which the author, date and place of composition are unknown. It is, however, of the 2d or 3d century A.D.; was written professedly in spring on the eve of a festival in honor of Venus. It is the «spring poem» par excellence. The refrain is «Cras amet qui nunquam amavit; quique amavit cras amet» which may be freely translated:

"Who hath never loved,
Shall he love to-morrow?
From to-morrow who hath loved
Shall he again love borrow?"

In the *Classical Review* (May 1905) an article assigned the poem to Sidonius Apollinaris.

PESADO, José Joaquín de, hō'sā hō-ä-kēn' dā pā-sä'dō, Mexican poet: b. San Augustin del Palmar, Mexico, 9 Feb. 1801; d. City of Mexico, 3 March 1861. He was self-educated, acquired an extensive knowledge of languages, science and history and in 1833 entered public life· as a member of the legislature of Vera Cruz. In 1834 he was elected governor of that state and in that year founded and conducted *La Oposicion*, also writing a short novel. He was appointed Minister of the Interior in 1838, Minister of Foreign Affairs in 1846, resigning in 1854 to accept the chair of *belles-lettres* at the University of Mexico. His poetry was of the neo-Catholic school established in France by Lamartine, but though excelling in biblical subjects his descriptions of nature are quite as deserving of attention. He published 'Poesias originales y traducidas' (1839); 'La Revélación' (1856); 'Gerusalemme Liberata,' a partial translation of Tasso (1860). Consult Bárcena, José M. Roa, 'Biografía', (Madrid 1878).

PESARO, pā-sä'rō, Italy, capital and port of the province of Pesaro e Urbino, situated at the mouth of the Foglia (which, like the town, was known in ancient times as Pisaurum) in a fertile plain backed by the Ardizi Hills, on the railroad between Bologna and Ancona. The castle and part of the mediæval walls are still standing; a bridge dating from Roman times crosses the Foglia; and the most important buildings are the ducal palace, built by the Sforza in 1455; the Palazzo Almerici, connected with which is the Ateneo Pesarese, containing a remarkable collection of majolica ware, a gallery of paintings and the rich Olivieri Library with 40,000 volumes and 3,000 manuscripts, including some of Tasso and Poliziano; the cathedral of S. Francesco, with a Gothic portal and a 'Madonna' by Bellini; and excellent schools, a theatre and an insane asylum, as well as a musical lyceum founded by Rossini, a native of the town. The grave of the Roman tragedian Accius (b. here 170 B.C.) is reputed to be about two miles from the city on Monte Santo Bartolo. Terra-cotta wares, silk, hemp and woolen textiles, sealing-wax, cream of tartar, ships, machinery, etc., are among the city's manufactures. It exports the product of the surrounding country, its figs, olives and truffles being particularly prized.

Settled by the Sicilians in early times, and then held by the Umbrians, Etruscans and Senonian Gauls, successively, in 184 B.C. it became the Roman colony of Pisaurum; was destroyed by Totila, the Ostrogoth; was given by Pepin to the Pope; and in 1631 again became a papal state, after being a possession of the Malatesta (1285) the Sforza (1445) and the Rovere (1512). Under the latter the city became a centre of art and literature through the patronage of Lucrezia d'Este; Bernardo Tasso wrote 'Amadis' here and the city was also the home of his son Torquato Tasso.

PESCADORES, pěs-kä-dō'rěs, **PENG-HU**, or **HOKO-TO**, a group of 48 small islands in the Fu-kien Strait between China and Formosa, forming an administrative dependency of the latter. Area, 85½ square miles. With Formosa they were ceded by China to Japan in April 1895 after the Chino-Japanese War. They are dangerous to ships passing through the strait, and are subject to stormy weather, on an average during 230 days of the year. Fishing is practically the only industry. Safe anchorage is obtainable at Makung on Hoko-to, the principal island. Pop. about 60,000, mostly Chinese.

PESETA, pě-sä'tạ, the chief Spanish monetary unit, equal to about 20 cents.

PESHAWAR, pě-show'ŭr, or **PESHAWUR**, India, (1) a city, capital of the Northwest Frontier Province, and of the division and district of Peshawar, in a small plain near the Kabul River, about 12 miles east of the eastern extremity of the Khyber Pass (q.v.). It is surrounded by a mud wall and entered by 16 gates. The Kabul gate has been rebuilt as a memorial to Sir Herbert Edwardes. Just outside the wall on the northwest is the Bala Hissar, a fort built of sun-dried bricks surmounting a small eminence, and completely commanding the town. The houses generally are built of brick and mud with wooden frameworks. The chief buildings and institutions comprise some handsome mosques, a clock-tower, English church mission, collegiate school, the Egerton Hospital, Martin lecture hall and institute, etc. The town is well drained and has an ample supply of well and canal water. Outside the wall are gardens and pleasure-grounds, and two miles to the west are the extensive military cantonments, where most of the civil offices are situated. Peshawar is traversed by the great route from Khorasan and Kabul to India through the Khyber Pass; and has a good trade. It has direct railway communication with Lahore through Attock and Rawal Pindi. Pop. about 100,000, including about 20,000 in the cantonments. (2) The district is the central one of the division. Area, 2,611 square miles; pop. about 800,000.

PESHITTO, pě-shē'tō, the standard Syriac version of the Holy Scriptures. See BIBLE, VERSIONS OF.

PESHWAS, the Brahman ministers of the great Mahratta dynasty in India, who in 1718 rose to such power that they ruled the Mogul Empire for a century. See INDIA, *History*.

PESO, pă'sō, a Spanish coin; a unit in many South and Central American countries, varying in value from $1.03 in Uruguay to 36½ cents in Chile.

PESSIMISM, an attitude towards the world, or a theory expressive of an attitude, which finds evil in general preponderant over good, unlike optimism (q.v.), which finds good dominant. Pessimism need not be articulate, and even if articulate, need not be reasoned. The book of Ecclesiastes is an example of pessimism of this naïve type. Theories may be designated pessimistic either from an internal or an external standpoint, according as the moral value they assign the universe as a whole fails to fulfil the norms of the proponents of the theory or of external critics, respectively. As European ethics in the past has been predominatingly Christian, setting a high worth on a personal God, on personal immortality and on order it has treated pantheistic, atheistic, agnostic or materialistic theories as pessimisms, and has likewise given a pessimistic interpretation to Oriental speculations which find the goal of all conduct in the abolition of the individual and his identification with the universe. These theories may be optimisms from the standpoint of their advocates, and as a matter of fact many of them are thus regarded. True philosophical pessimism, recognizing itself as such, is much less prevalent, though views which regard the world of appearances as essentially evil, and the sphere of the good as that of reason or worship or of some other higher activity, have been common ever since Parmenides. The first noteworthy example of true pessimism is to be found among the Epicureans, who considered pleasure as the mere absence of pain, yet regarded it as the greatest good. Scepticism led to a similar conclusion. In modern times, the chief exponent of pessimism is Schopenhauer (q.v.), who finds the true nature of the world in blind, purposeless, unhappy Will, which is «the living principle of reason» itself. Like the Buddhist, he finds the highest good in the annihilation of consciousness by suffering and sacrifice and artistic contemplation; but unlike the Buddhist he tends to regard this, not as a positive good, but rather as a mere respite from evil. Schopenhauer's pessimism is the result of the compounding of an Oriental natural history of values with Occidental norms. A similar view was held by von Hartmann, who attempted to mediate between Will and Reason by the essentially voluntaristic Unconscious. The philosophy of Nietzsche, notwithstanding the belief in the ultimate appearance of the Superman, contains a strong pessimistic trend in its condemnation of morality as it now exists.

Pessimism and optimism are not necessary alternatives, for they consist in an evaluation of the world as a whole, and the world, as a completed, conceivable whole may not exist, or if it exists, may not be subject to an evaluation. For example, it is quite possible that good and bad are terms which have no intrinsic meanings, but merely signify «better than some given standard» or «worse than that standard.» In such a case, it is quite reasonable to suppose that the world as a whole or human life as a whole furnishes the norm by which good and bad are judged, and the problem whether the world is good or bad loses all significance. The question might still remain open as to whether the general tendency of the world is to improve morally or to deteriorate. The theory that there is a general trend toward better things is called *meliorism;* the theory which finds the opposite tendency has no generally accepted name, but has been called *pejorism* by Max Müller. Pejorism is much rarer than pessimism; meliorism is the prevalent ethical opinion of the present time and has probably always occupied that position. That the world has any definite moral trend, however, whether for better or for worse, is not evident a priori. See OPTIMISM; PROGRESS; SCHOPENHAUER.

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PESTALOZZI, pĕs-tä-lŏt'sē, **Johann Heinrich,** Swiss educational reformer: b. Zürich, 12 Jan. 1746; d. Brugg, Aargau, 17 Feb. 1827. He was educated at the University of Zürich, and became a follower of Lavater (q.v.), to whose 'Memorial' he contributed. At the death of Bluntschli who was a friend of his, he became interested in educational matters. At the age of 23 he married. The perusal of Rousseau's 'Emile' filling him with dislike for the habits of a learned life, and for the general system of education in Europe, he turned his attention to farming. He studied agriculture, and then in 1767 bought a piece of land near Birr, in Aargau, built a house, which he called Neuhof. He became acquainted with the moral wretchedness of the lowest classes, and in 1775 began his career of instruction by the admission of the children of paupers into his house, turning his farm into a kind of asylum or industrial home. But his philanthropic and noble self-denial was derided, his confidence was abused, his own affairs declined, he was generally considered as a well-meaning enthusiast and his enterprise failed in 1780. Nevertheless, amid straitened circumstances he collected that knowledge of the state of the lower classes so admirably set forth in his novel 'Lienhard und Gertrud' (1781–85), a work which exerted a remarkable influence. This book details the influence for good of a high-minded woman at home and in the village. Other writings of his are alike numerous and important, and contain further elucidations of his principles. In 1798 he established a school at Stanz for refugees from the French invasion, but circumstances obliged him to abandon it, and he then took charge of a school at Burgdorf, where he also received pupils who paid for their instruction, so that he was enabled to employ able assistants. In 1802 he went to Paris as a deputy, and unsuccessfully tried to interest Napoleon in a plan for national education; in 1805 he removed his school to Yverdum, in the Pays de Vaud, where he occupied the castle given to him by the government. The grand principle of Pestalozzi's method was that of communicating all instruction by direct appeal to the senses and understanding, and forming the child by constantly calling all his powers into exercise, instead of making him a mere passive recipient, selecting the subjects of study in such a way that each step should best aid the further progress of the pupil. The principles of his method are clearly developed in his 'Wochenschrift für Menschenbildung.' The value of these principles, as well as the esteem in which they are now held, may be gathered from the fact that they are substantially at the basis of the normal school system of Europe. Pestalozzi was a poor organizer, manager and teacher; but he originated and gave the impetus to the ideas of social reform by education so prominent in the 19th century. Among his works were 'The Evening Hours of a Hermit' (1780); 'How Gertrude Teaches her Children' (1801); 'The Swan's Song' (1826). The best known of his many disciples is Fröbel. Consult 'Life and Works' by De Guimps (1880), and 'Life' by Pinloche (1901).

PESTH. See BUDAPEST.

PESTILENCE, general term for diseases of epidemic character in which a large proportion of the population of a district or country is affected and in which there is a high rate of mortality. Within historic times the term has been used to designate successively smallpox, erysipelas, syphilis, the bubonic plague, yellow fever, etc., which at different times have devastated whole countries and continents, e.g., the Black Death, now known to have been the bubonic plague. See PLAGUE.

PÉTAIN, pā'tăṅ, **Henry Philippe,** French general: b. April 1856. Educated at Saint Cyr and the École Supérieure de Guerre, he rose to general staff rank and in 1901 was appointed a professor at the latter school. At the outbreak of the European War he was a colonel on the retired list, but was immediately placed in command of a brigade. During the fighting and retreat at Charleroi he beat off some furious attacks by overwhelmingly superior enemy forces. His skilful withdrawal of the brigade from an untenable position led to his being placed at the head of a division, which he commanded at the first battle of the Marne. Like General Foch, who had also been a military professor, Pétain found the occasion to put his classroom theories to a practical test that proved a decided success. Within a few weeks, while still wearing his colonel's uniform, Pétain was a general in command of an army corps, and during the first offensive in May 1915, in the Artois sector, he took some 10,000 prisoners and numerous guns from the enemy In the Champagne battles of September he commanded the Army of Reserve and greatly distinguished himself in the capture of the Hand of Massiges. In February 1916, when the great German attack on Verdun opened, General Pétain was placed in command of the armies defending the historic fortress, in succession to General Balfourier. He arrived at Verdun on the fourth day of the battle; four miles of ground had been lost, and with it gun positions which made the task of the defense almost impossible. The crisis came the same evening; the German assault on the two miles of the Douaumont front reached a pitch of unprecedented violence. It was the culmination of the German effort, the last blow before which the fortress was to crumble. The Kaiser was watching through his glasses and victory was already taken for granted. That same night tidings were flashed to Berlin that Douaumont, the key of the last defense line of Verdun, was in German hands. The next morning, 26 Feb. 1916, Pétain launched the counter-attack and drove the invaders back. In April he was appointed to one of the three group commands, the central *Secteur,* from Soissons to Verdun, while General Nivelle continued the defense of Verdun. In December 1916 Pétain was raised to the dignity of a marshal of France; in April 1917 he became chief of the staff, and on 15 May 1917 was appointed commander-in-chief of all the French armies on the western front. His tenure of that responsible post was remarkably free from those «regrettable incidents» that at times marked the disunited efforts of the Allies. On the unification of all the commands under General Foch in April 1918, Marshal Pétain received a staff appointment. See WAR, EUROPEAN — VERDUN, CAMPAIGN.

PETAL, one of the leaf-like parts of the corolla of a flower. See COROLLA; FLOWER.

PETALESHARO, pêt-ă'lĕsh-á-rō, Pawnee chief of the Skidi band. He made himself famous by rescuing from sacrifice a young girl captive from the Sioux tribe with which the Pawnees were at war. As she was being led to the place of sacrifice Petalesharo seized her, flung her upon a horse and springing upon another eluded pursuit and carried her near enough to her own people for her to be safe from pursuit. He then daringly returned to his tribe and faced their anger with such intrepidity that his conduct went unpunished. Later he succeeded in abolishing the practice of human sacrifice and upon his visit to Washington in 1821, acting as a delegate from the Pawnees, he was the recipient of much attention and was presented with a medal in recognition of his service to humanity.

PETALUMA, pĕt'ą-loo'mą, Cal., city of Sonoma County, on the Petaluma River and on the Northwestern Pacific and the Petaluma and Santa Rosa railroads, 35 miles north of San Francisco. It contains a fine plaza and park, a public library, flour and silk mills, foundries, machine shops, engine works, cheese factories, tanneries, planing mills, etc. Pop. 5,880.

PETARD, pĕ-tärd, in ancient warfare, a bell-shaped engine, made of gun-metal, loaded with from 9 to 20 pounds of powder and then exploded. It was employed to break down gates, bridges, barriers, etc., to which it was hung by means of a wooden plank attached to it. It was also used in countermines to break through the enemy's galleries.

PETAVIUS, pe-tā'vĭ-ŭs, **Dionysius** or **Denys Pétau,** pā tō, French theologian: b. Orleans, France, 21 Aug. 1583; d. Paris, France, 11 Dec. 1652. He was educated at Orleans and at Paris pursuing with avidity the studies of mathematics, belles-lettres and philosophy in particular. In Paris he became an intimate friend of Isaac Casaubon (q.v.). In 1602, when but 19 years of age, he was appointed to the chair of philosophy at the University of Bourges. He resigned in 1605 to enter the order of the Jesuits. He instructed in rhetoric at Rheims in 1609; at La Flèche in 1613; and at the College of Paris in 1618. Subsequently he studied theology at the College of Pont-ä-Mousson and in 1621 accepted the position of professor of theology at the University of Paris, which he occupied 22 years. After 1646 he gave up teaching and devoted himself entirely to literature, completing 49 books dealing with philosophy, history and theology, which give him rank as one of the greatest scholars of the Jesuit order. It has been claimed for him that he was the restorer of dogmatic theology. His chief work, 'Opus de Theologicis Dogmatibus' (5 vols., 1644–50), was uncompleted at his death. He published annotated editions of 'Synesius' (1612); 'Themistius' (1613); 'Julian' (1614); 'Nicephorus' (1616); 'Epiphanius' (1622); etc., besides his historical and theological works, among which are 'Opus de Doctrina Temporum' (1627); 'Uranologion' (1630); 'Rationarium Temporum' (1633).

PECHORA or **PETCHORA**, pech-ŏ'rä, a river of European Russia, which rises in the north of the government of Perm, on the western slope of the North Ural Mountains; flows almost due west, then turns north across the eastern part of the government of Vologda, enters the government of Archangel and on reaching lat. 66° N. makes a long curve southwest to long. 52° E., when it turns abruptly due north and enters Pechora Bay by a great number of channels through a broad delta. Its total course is about 980 miles, of which 730 miles are navigable. Its upper reaches are frozen for six months in the year and the lower stretches for nearly five months. Its principal affluents are the Izhma from the south and the Ussa from the east.

PETECHIÆ, pĕ-tĕk'ĭ-ē, small, purplish or crimson spots which appear on the skin in certain diseases. They are caused by hemorrhage into the subcutaneous tissues. These spots are well defined and of varible size. They are not raised above the surface of the skin and do not fade on pressing. They may be symptoms of purpura or scurvy and are sometimes seen in scarlet fever, measles and in that form of smallpox called varioloid. When large, these spots are sometimes called ecchymoses.

PETER, Saint. See SAINT PETER.

PETER I (the Great), Alexeievitch, emperor of Russia: b. near Moscow, 9 June 1672; d. Saint Petersburg, 8 Feb. 1724. He was the son of the Tsar Alexei or Alexis Mikhailovitch. His elder brothers, Fedor and Ivan, were feeble in constitution. Fedor succeeded to the throne as Fedor III in 1676, and died in 1682. An attempt was then made to have Peter assume the imperial dignity with his mother, the Tsarina Natalia Kirillovna, as regent. This arrangement did not please Sophia, the third daughter of Alexis, who had hoped to reign in the name of her feeble brother. She roused the Strelitz, or bodyguard, and had Ivan proclaimed tsar jointly with Peter, and herself regent. Peter gave early proof of capacity, and under the guidance of the Genevese Lefort took enthusiastically to the study of military science. In 1689 he married Eudoxia Fedorovna, who belonged to a powerful family, the Lapuchin. This alliance enabled him openly to oppose his sister, and in the course of this year he succeeded after a brief struggle in wresting the power from her. She was confined in a convent, where she died in 1704. Peter was now virtually sole emperor, though, till the death of his brother in 1696, he associated the latter's name with his own in the ukases of the empire. With the assistance of Lefort and Patrick Gordon he began to organize his army; but his great ambition was to form a navy. He went himself to Archangel, and cruised on board Dutch and English ships. He brought Dutch and Venetian shipbuilders to Russia, and sent Russians to Venice, Holland and Leghorn to learn shipbuilding. At length a fleet, which he had constructed, enabled him to conquer Azof from the Turks. His reforms excited great opposition among the old Russian party of the nobility. A few years after his marriage he repudiated his wife for the encouragement she gave the reactionary party. In 1697 he suppressed with great barbarity a revolt of the Strelitz. Leaving his capital under the military command of Gordon, he then proceeded on that remarkable tour through Europe, in which his vast designs for the improvement of his people first began to appear. He formed an extraordinary embassy to Holland, which he accompanied incognito. After working some weeks in an Amsterdam shipyard he took up his residence in August at Saardam, a famous shipbuilding port, and for several months worked for wages as a ship-carpenter under the name of Peter Michaeloff. Here for a time he lived alone in a little hut, meanwhile keeping up a correspondence with his ministers of state at Saint Petersburg. In 1698 he spent about three months in a similar manner in England, where he worked in a Deptford dockyard; and here also, as in Holland, he procured a great number of sailors and artificers, as well as engineers, for a great canal which he projected between the Don and the Volga. He afterward visited Vienna, where he particularly acquainted himself with the organization of the army. He was about to proceed into Italy, when he received intelligence of another revolt of the Strelitz, upon which he returned home, and through Gordon repressed the revolt, savage vengeance being taken on the insurgents. Peter organized his army on the German model; served himself in it as a private soldier, and worked his way up through all the subordinate grades before he received a commission, an example which he compelled the young nobles to imitate. He obliged his subjects to adopt European costume by taxing their long Tartar robes; emancipated the women from Asiatic seclusion; reformed the calendar; committed the charge of the public revenue to a regular administration; and made himself virtually the head of the Church. He founded schools of navigation and mathematics, brought cattle and herds from Silesia, called into his dominions foreign artisans of all kinds, established manufactories of arms, tools and fabrics, and distributed metallurgists through the mining districts of Russia. Such were the peaceful occupations of his whole reign; but he was not satisfied till he had given Russia a sea-board, and this could only be done at the expense of Sweden. Accordingly in 1700, when he thought his army was ready, he joined Denmark and Poland in a league against Charles XII (q.v.). His defeat at Narva, 30 Nov. 1700, and other early reverses, did not discourage him. In two following campaigns he gained some advantages over the Swedish generals, and 27 May 1703 his conquests enabled him to accomplish his great object by laying the foundation of Saint Petersburg on the Neva. The decisive victory of Poltava, 8 July 1709, confirmed and extended his conquests; but the war dragged on until 1713, and Turkey becoming involved in it he nearly threw away all his successes by allowing himself to be hemmed in by the Turkish army on the Pruth. The empress Catharine I (q.v.), whom he had married secretly in 1706, and publicly in 1710, opened negotiations with the grand vizier, and procured a peace, with the relief of the Russian army, for the surrender of Azof and some small forts on the Black Sea. Not satisfied, however with all his temporal power, Peter had suppressed the patriarchate and declared himself head also of the church. In 1713 Peter transferred the senate from Moscow to Saint Petersburg. His eldest son, Alexis, was in open sympathy with the reactionary party. Peter had him tried for conspiracy and condemned to death, 5 July 1718. He died in prison 7 July. The Peace of Nystadt with Sweden was signed in 1721. By its terms the tsar retained nearly all his conquests, including Livonia and Esthonia. He relinquished Finland, and paid to Sweden about $2,000,000. The senate after this peace conferred on him the title of emperor of all the Russias, to which were added the epithets of the Great and Father of His Country. In 1724 Peter founded at Saint Petersburg the Academy of Sciences, which was not, however, opened until 1726. In spite of the great material services Peter rendered to his country he remained to the last a man of coarse tastes and brutal propensities, addicted to the lowest vices and ferocious cruelties. His death followed a period of the severest suffering. The empress was declared his successor. The so-called Testament of Peter the Great, defining his political policy, was probably written at the order of Napoleon I. Consult Motley, J. L., ‘Peter the Great’ in Harper's Half-hour Series (New York 1877); Brückner, A., ‘Peter der Grosse’ (Berlin 1880); Minzloff, R. J., ‘Pierre le Grand dans la Litterature Etrangère’ (Saint Petersburg 1872); Schuyler, E., ‘Peter the Great, Emperor of Russia’ (2 vols., New York 1884); Browning, R., ‘Peter the Great’ (London 1898).

PETER II, Alexeievitch, Russian emperor, grandson of Peter the Great: b. Saint Petersburg, Russia, 22 Oct. 1715; d. there, 9 Feb. 1730. Orphaned in his childhood, he was sequestered by those in authority, and was rescued by a coterie of the nobility who prevailed upon his grandmother, Catharine I, to will him the throne. There is much doubt as to whether the will later produced was legal, but on the strength of it Peter was proclaimed emperor, 18 May 1727. During his brief reign he was controlled by Mentchikof, who endeavored to marry the 13-year-old emperor to one of his daughters. In this he was frustrated by his rival, Dolgoruki, who also wished to ally his family with the imperial one. Dolgoruki took him to Moscow, and there he was crowned 25 Feb. 1728. The intrigues of the several factions came suddenly to naught upon the death of the emperor from smallpox in 1730. Anna Ivanova succeeded to the throne.

PETER III, Feodorovitch, emperor of Russia, grandson of Peter the Great, son of Anna Petrovna and Duke Karl-Friedrich: b. Kiel, 21 Feb. 1728; d. Ropscha, 17 July 1762. Succeeding his father as Duke of Holstein, he bore the name Karl Peter Ulrich. In 1742 he was appointed grand-duke and heir-apparent by his aunt, the Empress Elizabeth, the direct male line having failed with Peter II. Three years afterward he married Sophia Augusta, Princess of Anhalt-Zerbst, later the Empress Catharine II (q.v.). He succeeded Elizabeth 5 Jan. 1762; immediately concluded a peace with Frederick II of Prussia, restoring the parts of Prussia conquered by Russia and sending 15,000 Russian troops to join Frederick's army; and in general showed himself so devoted to German ways of living, and so enamored of Frederick of Prussia, that the nobles soon rose against him. His wife, Catharine, already accused of adultery, joined the conspiracy, in which her lover Orloff and his brother (see ORLOFF) also took part, and 8 July 1762 was proclaimed empress. Peter offered to retire to Holstein, but he was forced to abdicate and then was assassinated by the conspirators. Consult Bain, R. N., ‘Peter III, Emperor of Russia’ (Westminster 1902).

PETER I, called KARAGEORGEVITCH as grandson of Karageorge or Czerny George, former king of Serbia: b. Belgrade, 1846. His father, Alexander Karageorgevich, ousted Michael Obrenovitch in 1842, but in 1858 was exiled by the returning Obrenovitch dynasty. Peter was educated in Russian military schools and at Saint Cyr; fought in the Franco-Prussian War, being thrice captured; furthered the Herzegovinian rising in 1875; married Zorka, princess of Montenegro, in 1883 and lived at Cettinje until her death in 1890. He then resided quietly in Geneva until June 1903, when he was proclaimed king of Serbia by the army officers who had killed King Alexander Obrenovitch and Queen Draga. A Pan-Slavist apparently, he is a Liberal with leanings toward Russia, but is commonly reckoned the mere tool of the army officers who themselves occupied as posts of authority. Peter's elevation to the throne was received coldly by most of the nations. Since his occupation, he has founded (1904) the Order of the Star of Karageorgevitch in four classes. Upon the conquest of Serbia in 1916, he fled to the Island of Corfu, returning to Serbia in 1918 after its evacuation by the Bulgarians and Austrians.

PETER, Epistles of. First Peter, Historical Attestation.— Two letters appear in the New Testament with the name of Peter as author. The early testimony that the first of these Epistles was written by him is unusually early and strong. It has often been repeated that except 1 John no other of the Catholic Epistles is so strongly attested in early Christian literature.

Objections to Petrine Authorship.— Many critics have, however, doubted for various reasons that Peter was the author of 1 Peter. (1) It is objected that there exists a dependence on the Epistles of Paul which cannot be attributed to Peter. Certainly, as is now generally recognized, this Epistle shows acquaintance with and use of both Romans and Ephesians, but it is not so generally admitted that this fact precludes Petrine authorship. On the other hand, it may fairly be said that nothing which we know of Peter justifies us in holding that he was an original thinker, and there seems to be no decisive reason why he might not have made such use of Paul's writings as is here made. The same may be said as to the more indefinite assertion that the theological conceptions may be denominated Pauline. It is easy to exaggerate the difference between the preaching of Paul and of the earlier Apostles; indeed, there is no reason to suppose that any fundamental differences existed between the two. In fact it is simpler to explain the relations to Pauline language and thought on the basis of the genuineness of the letter than otherwise. (2) Further objection is made to Peter's authorship on the ground of the lack of personal reminiscences of the life of Jesus. In answer, it is argued that it is unfair to set up any standard as to what material a man shall use in writing, and that the story of the ministry of Jesus which we find in the Gospels is not to be regarded as the substance of Apostolic preaching. In fact there are a number of slight expressions, too subtle to be the work of a forger, which show the familiarity of an eyewitness with the ministry of Jesus, and there are a much greater number of parallels with his teaching. (3) It is also urged that the conditions of the Christians addressed, especially in regard to persecution, require a date later than must be set for the death of Peter. But, in answer, it is said that Peter might have lived to a time later than the Neronian persecution, and by others that the conditions implied may reasonably be held to have already existed in the time of Nero. (4) Another difficulty is made out of the fact that the language and style of the Epistle is better than can reasonably be attributed to the Galilean Apostle. It is answered that as Greek was commonly spoken in Galilee in the time of Christ, Peter may have used it familiarly from his boyhood and have improved in his use of the language during the years of his Apostolic travels. But it is not necessary to credit Peter alone with this Epistle, since the connection of Silvanus with it (v, 12) is consistent with the view that he aided in putting the letter in shape, if, indeed, the phrase does not require this supposition. In view of these and similar considerations the great majority of scholars hold strongly to the traditional Petrine authorship.

Persons Addressed.— Those to whom the letter was sent were addressed (i, 1) as members of the "Dispersion," the Jewish name at that time for those Jews who lived outside of Palestine, but various statements in the body of the letter so clearly imply that the readers were of Gentile origin that it is agreed that the word "Dispersion" is used figuratively, not literally. These readers are said in the same address to live in Pontus, Galatia, Cappadocia, Asia and Bithynia, the Roman provinces which covered practically the whole of Asia Minor.

Date and Place of Composition.— The date of the Epistle, if genuine, is, as has already been suggested, dependent on the conditions of the readers in regard to persecution and the date to be set for the death of Peter. While the argument of Ramsay for 80 A.D. is in many ways plausible, the majority of scholars still hold that it was written between 64 and 67. The majority also hold that "Babylon" given in v. 13 as the place of composition is used figuratively for Rome, in harmony with what is held to have been already Jewish usage, as it is shown by the Revelation to have later been Christian usage.

Contents.— While the plan of the letter is not very sharply defined, the contents may be briefly summarized as follows: i, 1–12, Introductory; I, a series of exhortations relating to the individual lives of the readers, to hope, holiness, reverential fear, love and desire for truth, i, 13–ii, 10; II, a second series of exhortations with regard to relations to others, the civil power, submission of slaves to their masters, husbands and wives, and duties in view of persecution, ii, 11–iv, 6; III, another series of varied exhortations touching the individual life, iv, 7–v, 9; the conclusion being a few personal words presumably in Peter's own handwriting and two brief prayers.

Character.— This letter is often called an "Epistle of hope." Its primary object seems to have been a message of encouragement to the persecuted Christians of the time. Von Soden characterizes it thus: "This simplicity of thought joined with intimacy of appeal, this lofty moral earnestness joined with joyous, indeed jubilant, hope — amid a prevailing atmosphere of trial and affliction . . . — all combine to make this short, impressive letter one of the most precious monuments of primitive Christianity, a jewel of the New Testament worthy to be inscribed with the name of the great Apostle."

Second Peter, Historical Attestation.—The second Epistle ascribed to Peter was not till late given an undisputed place in the Canon, and the authorship which it claims is more widely set aside than in the case of any other book of the New Testament. Eusebius reckons it among the "disputed" books, though this must not be taken to mean that he did not himself accept it. It is found in the Sinaitic and Vatican, our oldest manuscripts. In the 3d century it had found considerable acceptance, but the traces of its influence in the 2d century are comparatively scanty and uncertain.

Objections to Petrine Authorship.— Against its claim to be written by the Apostle Peter (i, 1), it is urged (1) that the author makes conspicuous endeavors to have it appear thus. Not only does the claim stand in the address of the letter, but also it is argued that the references to the first letter, to the Transfiguration, to the prediction by Jesus of Peter's death, all are introduced to substantiate this claim. In answer, it is argued that Peter certainly might have said all that is attributed to him. Attention is also called to the fact that in many points there are somewhat striking differences between 1 Peter and 2 Peter, which an imitator would have been expected to avoid, as, for example, that in the opening address the very name of Peter appears in a form quite different from that in the first letter. (2) The unlikeness between the two letters in vocabulary and style is also urged against Petrine authorship. This should certainly be recognized to the full, but its significance is greatly lessened if the first letter is largely due, as many hold, to the aid of Silvanus. A difference in assistants might practically explain the whole difference in the letters, and at the same time it should be noted that certain subtle resemblances exist which need to be taken into account. (3) The unlikeness in the thoughts advanced is used as an argument that the two Epistles cannot be due to the same author. To this it has been answered that while the encouragements of 1 Peter are lacking, or, rather, are replaced by warnings, and while instead of «hope,» which is the keynote of 1 Peter, «knowledge» is emphasized in 2 Peter, this may fairly be explained by the different conditions and needs of those addressed. (4) It is also urged that the errorists attacked must have belonged to the 2d century. But while doubtless there were such errorists in the 2d century, it can scarcely be demonstrated that such did not exist in the 1st century as well. To very many minds the Epistle of Jude, to which 2 Peter is according to general consent largely indebted, would demonstrate the early date of the evils combated. (See article JUDE, EPISTLE OF). (5) It has sometimes been insisted that an Apostle could not have used the material of Jude as did the author of 2 Peter. But such assertions are unsafe. It is at least conceivable that Peter, recognizing the importance of the warnings of Jude, might have given them the weight of his authority. (6) It is further held that some phrases, as «your Apostles,» the reference to Paul's Epistles as «Scripture,» and the fact that some were disappointed at the delay of the expected end, all imply a later date than would be consistent with Peter's authorship. But many thoughtful scholars do not feel that this is a necessary inference. (7) It is also urged that the Epistle as a whole is unworthy of the Apostle Peter. But there seems to be of late an increasing recognition that, even though not a great creative work, it yet deserves what Calvin said of it: «Since the majesty of the Spirit of Christ exhibits itself in every part of the Epistle, I feel a scruple in rejecting it wholly.» Many scholars of the first rank still accept the Petrine authorship, and many who do not accept it would also not characterize the book as a forgery. On the contrary, they would insist that for the author to give the name of Peter to his work was not dishonestly intended, but was instead a literary device not uncommon at the time nor to be regarded as discreditable when judged as it should be by the standards not of our age but of his own.

Circumstances of Composition.— If genuine, it cannot be later than 80 in any case, or than 66 if Peter perished in the Neronian persecution, and the place of composition would naturally be Rome if the earlier date is accepted, but would be wholly uncertain with the later date. If not genuine, the date might fall almost anywhere between 80 and 130, but the language of the Fathers would seem to show that it was composed not later than the first quarter of the 2d century, and it might well have been before 100. The place would then be wholly a matter of conjecture, as would the special evils which it was its purpose to correct.

Contents.— After a brief address, i, 1, 2, the author exhorts to growth in the Christian life to full knowledge of Christ, i, 3–11; then justifies his reminders by the Divine testimony at the time of the Transfiguration, i, 12–20; denounces the false teachers and warns of doom, ii, 1–22; and makes a final appeal to his readers based on the coming destruction of the world, iii, 1–18.

Bibliography.— Bigg, Ch., 'Commentary on the Epistle of Saint Peter' (International Critical Commentary 1901); Mayor, J. B., 'The Epistle of Jude and the Second Epistle of Saint Peter' (1907); Moffatt, Jas., 'Introduction to the Literature of the New Testament' (1911); Salmon, Geo., 'Historical Introduction to the Books of the New Testament' (1885); Zahn, Theodor, 'Introduction to the New Testament' (Eng. trans., Vol. II, 1909).

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PETER, Order of. See ORDERS, ROYAL.

PETER OF BLOIS, blwä, English prelate: b. Blois, 1135; d. about 1208. He received his education at Paris and Bologna; became tutor to William II of Sicily and keeper of the royal seal. In 1173 he entered the service of Henry II of England, by whom he was dispatched on missions to Paris and Rome. In 1176 Peter became secretary to the archbishop of Canterbury. From 1191 to 1195 he was secretary to Queen Eleanor. He was one of the most learned men of his time. He wrote several works of which the 'Epistles' (Brussels 1480) is the most important.

PETER CLAVER, Saint, Spanish Jesuit missionary: b. at Verdu in Catalonia 1580; d. Cartagena, New Granada, South America, 8 Sept. 1654. He entered upon his novitiate in the Society of Jesus at Tarragona in 1602, and upon the establishment of a province of his order in New Granada he was sent to Cartagena as missionary to the negroes in 1610. After two years of further study in the College of Santa Fé de Bogota, he was ordained priest; and from that time labored heroically for 44 years in behalf of the blacks. Bearing food and medicines he visited the slavers immediately upon their arrival in Cartagena harbor, and when the negroes had been landed, instructed them, organizing a band of catechists for the purpose; directed their care in the hospitals; obtained for them humane treatment by their owners; regularly conducted for such as remained in Cartagena services in the Jesuit Church; and extended his labors widely among the mines and plantations of the province. Unable to suppress the slave trade, he labored ceaselessly to mitigate its cruelties through a noble ministry to its victims. He was beatified by Pius IX 16 July 1850 and canonized by Leo XIII 15 Jan. 1888. Consult the lives by

Schelkle (1833; a translation into German of the work by the Jesuit Fleurian); and Höver (1888). Also de Andrada, F., 'Lives of the Saints' (Madrid 1657).

PETER THE CRUEL, king of Castile and Leon. See PEDRO THE CRUEL.

PETER THE HERMIT, preacher of the first crusade: b. diocese of Amiens about 1050; d Neufmoutier, near Huy, 8 July 1115. Many fictitious stories, have been given of his early life. It is generally believed that he had been a French military officer, and that he made a pilgrimage to Palestine about 1093 but did not actually reach the Holy City, owing to the dangers encountered. He is reported to have made a journey to Rome and by some is credited with having proposed the Crusades to Pope Urban II, who is generally regarded as their author. After the Council of Clermont (see CRUSADES), he preached the crusade in central and northern France, everywhere arousing unprecedented enthusiasm. He journeyed about on mule-back, clad in a hermit's robe, and bearing in his hand a crucifix. Wherever opportunity offered he urged the cause. The success of his enthusiastic harangues was proportionate to the boldness of his scheme and the ignorance of his auditors. Peter himself led the way through Hungary at the head of the first undisciplined multitude of more than 30,000 men, a comparatively small number of whom survived to reach the city. He preached on the Mount of Olives 8 July 1099, took part in the capture of Jerusalem (15 July); and, having witnessed the accomplishment of his undertaking, returned to his native country, where he founded the abbey of Neufmoutier and died its prior. Consult Donnet, F., 'Pierre l'Hermite et la Famille L'hermite d'Anvers' (Antwerp 1893).

PETER IBBETSON. The novel which first brought to George Du Maurier fame as a writer of fiction. Its success led to the writing of the two other novels, 'Trilby' and 'The Martian,' which complete the author's major literary achievement. It is important to remembers that these works were produced as a venture, by one who was not a professional writer. Du Maurier was an artist, and first became famous as an illustrator of *Punch*. In 1859, at the age of 25, he suddenly lost the sight of one eye as a result of detached retina. When the sight of the other eye became uncertain, he lived under the fear of becoming unable to earn his living by the prosecution of his regular work. He therefore turned to writing. About 1891, encouraged by Henry James, Du Maurier wrote 'Peter Ibbetson' for Harper and Brothers. The story was published serially in *Harper's Magazine* in 1891 (June to November numbers inclusive), and was later issued in book form. Three factors contributed to the success of the work. First, the scenes of the story are those of Du Maurier's own early life, and over the whole narrative, particularly over the early chapters, there hangs; a truly delightful atmosphere of reminiscence. Certainly, few readers can resist the appeal of Du Maurier's narrative of young Peter's journey from London to Paris — from «a dingy house in the heart of London in a long street of desolating straightness that led to a dreary square and back again,» to Passy, the suburb of Paris, where he awoke to find himself «on a beautiful June morning in a charming French garden, where the warm, sweet atmosphere was laden with the scent of lilac and syringa, and gay with butterflies and dragon-flies and humblebees.» Second, the supernatural element attracted many readers. The action of the story centers about the ability of Peter Ibbetson and Mary, Duchess of Towers, to live in the world of dreams a life entirely apart from their actual life. Lastly, Du Maurier illustrated his own story with the skill which only a gifted artist can summon. The least artistic feature of the novel is the handling of the supernatural element. The delicate feeling evidenced in the autobiographical portion constitutes the chief charm of the story, and will keep the work alive for a long time. 'Peter Ibbetson,' like 'Trilby,' has been successfully dramatized.

WALDO H. DUNN.

PETER LOMBARD, or PETER THE LOMBARD, Italian theologian: b. at Lumello, Lombardy, about 1100; d. 1164. He was educated at Bologna, Rheims and under Abelard at Paris. He became professor of theology in the Notre Dame School and was made bishop of Paris in 1159. After a year in charge of the see he resigned. He compiled 'Sententiarum Libri IV,' collected from the works of Saint Augustine and other doctors of the Church Consult Harnack, A., 'History of Doctrine' (Eng. trans., Boston 1899); De Ghellinck, 'The Book of Sentences' (in *Dublin Review,* 1910); Protois, 'Pierre Lombard, son époque, sa vie, ses écrits, son influence' (Paris 1881).

PETER MARTYR, Protestant divine: b. Florence, 1500; d. Zürich, 1562. As Pietro Martire Vermigli, son of Stefano Vermigli, he entered at 16 the order of the regular canons of Saint Augustine, at the monastery of Fiesole. In 1519 he removed to Padua, where he studied Greek and philosophy. In 1526 he commenced to preach, and attracted great applause in several cities of Italy. For a time he was prior of Saint Fridian's at Lucca. After receiving numerous important offices in his order his religious opinions were considered as savoring too much of the doctrine of the reformers, Luther and Zwinglius. At length he renounced Roman Catholicism, and it became necessary for him to quit Italy. At Zürich, in Switzerland, he was received in a friendly manner by the Protestant clergy (1542). Soon after he became professor of divinity at Strassburg, and in 1547 accompanied Bucer, Fagius and other learned reformers, on the invitation of Archbishop Cranmer, to England, where he was made professor of divinity at Oxford and canon of Christchurch. Martyr had followed the example of Luther in marrying a nun who had renounced her vows. He was appointed to the theological chair at Oxford in 1549, and became a very efficient assistant to the English reformed clergy in carrying on their plans of innovation in the Church. On the accession of Queen Mary, being commanded to quit the country, he returned to Strassburg and resumed his former situation. In 1556 he removed to Zürich to occupy the office of professor of theology. In 1561 he assisted at the famous conference between the Catholics and Protestants held at Poissy, in France. He was the author of many works on theology and commentaries on the books of both the Old and the New Testament.

PETER PAN, a play for children written by Sir James M. Barrie in 1904. In 1905 it was produced in New York, Miss Maude Adams assuming the principal rôle.

PETER PARLEY. See Goodrich, Samuel Griswold.

PETER-PENNY, or PETER-PENCE. See Peter's Pence.

PETER SCHLEMIHLS WUNDERSAME GESCHICHTE. 'The Wonderful History of Peter Schlemihl' by Adalbert von Chamisso — first published in Germany in 1814, in the United States in English translation in 1825 — is one of the most famous fairy-tales of German Romanticism. The fundamental idea, that a man can lose his shadow, Chamisso probably took from folk-lore and he made it a fascinating means of putting the reader in an atmosphere hovering between the real and the fantastic. The meaning which Chamisso gave to the shadow seems to be social repute, which men imperatively demand of each other without testing it for its true value. Schlemihl, a Hebrew name, originally meaning friend of God, Theophilus, was also used euphemistically by the Jews for a man who is denied all success in the world. Our Peter Schlemihl exchanges his shadow for the gold sack of Fortunatus, but only to fall a victim to unhappiness very soon, since men withdraw from him on account of his defect and he himself becomes involved in guilt. Yet when the devil wants to return his shadow to him in exchange for his soul, Schlemihl, as the friend of God, rejects the proposal and throws away the magic gold sack besides. He seeks refuge in nature and travels about the world in seven-league boots. When overtaken with sickness he is reconciled with his fellow-men who take care of him and in his sickness do not look for his shadow. Finally, however, he returns to his studies of nature and finds his deepest satisfaction in communion with her and his own better self.

Undoubtedly 'The Wonderful History of Peter Schlemihl' contains features and experiences of Chamisso's own, but the poet himself protested against carrying the comparison between him and the hero of his story too far. Consult edition in 'Deutsche National-Literatur' (1882–98, Vol. 148, with excellent introduction and references); English translation in 'German Classics' (Vol. V).

Ewald Eiserhardt.

PETER SIMPLE, a tale of life on the sea, told in his best vein by Captain Marryat and first published in 1834.

PETER THE VENERABLE, Abbot of Cluny: b. Montboissier, about 1092; d. Cluny, 25 Dec. 1156. He was educated in a monastery of the Cistercians, and entered the monastery of Cluny in 1111. In 1122 he became abbot there and for 35 years exerted a powerful influence for good in the West. In 1134 he attended the Council of Pisa and brought about a recognition of Innocent II as the legitimate Pontiff. To Abelard, Peter gave a refuge in the closing years of the former's life. Peter was a scholar of great ability. He caused a translation of the Koran to be made, which for many years was the only one in existence, and wrote several treatises including those 'Against the Jews'; 'Two Books of Miracles,' and 'Against the Saracens.' For these and his other works consult Migne, 'Patrologia Latina' (Vol. CLXXXIX). Consult also Demimcied, 'Pierre le Vénérable' (new ed., Paris 1895); d'Avenel, J., 'Vie de Pierre le Vénérable' (ib. 1874); Wilkens, C. A., 'Petrus der Ehrwürdige' (Leipzig 1857).

PETERBORO, N. H., town in Hillsborough County, on the Boston and Maine Railroad, 40 miles southwest of Manchester. It has a public library, a historical society, basket factories, cotton mills, etc. In recent years groups of artcraft workers, art and music students have established colonies in Peterboro. The town owns the water-supply system. Pop. 2,277.

PETERBOROUGH, pē'tėr-bŭr-ō, **Charles Mordaunt**, 3d Earl of, English soldier: b. about 1658; d. Lisbon, Portugal, 25 Oct. 1735. He succeeded to his title and estate in 1675, went to Holland in the reign of James II, and, entering into the scheme of his dethronement, returned to England with William III, by whom he was created Earl of Monmouth. He succeeded to the earldom of Peterborough in 1697, and in 1705 was employed as joint-commander with Sir Cloudesley Shovel of the English army in Spain, in the War of the Spanish Succession. In 1710–11 he was appointed ambassador to Turin and other Italian courts, and in 1712 governor of Minorca. In 1722 he was made general of the marine forces of Great Britain. Lord Peterborough was intimate with his literary contemporaries, and was himself a writer of verse. He figures as Lord Ormont in George Meredith's novel, 'Lord Ormont and His Aminta.' Consult Warburton, 'Memoirs of Charles Mordaunt' (1853); Russell, 'Memoir of Charles Mordaunt' (1887); Stebbing, 'Peterborough' (1890).

PETERBOROUGH, Canada, a port of entry and county-seat of Peterborough County, Ontario, on the Outonabee River and Trent Valley Canal, and on the Grand Trunk and Canadian Pacific railways, 75 miles northeast of Toronto. The city is well laid out with wide and regular streets, and has a city hall, post office, customs and inland revenue buildings, mechanics' institute, normal school, collegiate institute, 11 other schools, 13 churches, a Young Men's Christian Association building, Young Women's Christian Association building, a public library, hospitals, banks and daily and weekly newspapers. A United States consular agent is resident here. Peterborough is the centre of a rich agricultural region. It exports lumber, peas, oats, barley, wheat, flour, leather, furs, cheese, wool and pork. The manufactures include steam-engines, agricultural implements, mill machinery, foundry products, furniture, fur garments, harness, boats, electrical machinery, mining machinery, laundry machinery, bricks and tiles, aerated water, silk labels, pianos, locks, canoes, flour, quaker oats, cream separators, dairy supplies, steel window sashes, marble, yarn, carpets, women's and children's dresses, and mattresses. There are saw and planing mills, electrical and carbon works. A hydraulic lift-lock, the largest of its kind in the world, designed to lift vessels 140 feet long to a height of 65 feet in one movement, was completed at Peterborough in 1904. (See CANADIAN CANALS). There are now 50 miles of water mains, 40 miles of concrete sidewalk, five miles of asphaltic concrete pavement, and 30 miles of sewers in the city. The waterworks system, electric distribution system, garbage disposal plant and sewerage system are owned and controlled by the city. The city is the headquarters for Canadian General Electric Company, De Haval Dairy Supply Company, Vermont Marble Company for Canada, Quaker Oats Company for Canada. Pop. about 25,000.

PETERBOROUGH, England, an episcopal city, in the county and 43 miles north by east of the town of Northampton, mainly on the left bank of the Nen. It is the railway centre of a large agricultural district; its corn and stock markets and its manufactures of agricultural implements are of great importance. The principal building is its cathedral, founded by Peada, son of Penda, fourth king of Mercia, in 655, and destroyed by the Danes in 870. Rebuilt in 966, in 1116 a great part of the edifice was destroyed by fire; in the following year its restoration was commenced; but not till the opening of the 16th century did the structure assume its present aspect. The prevailing character of the building is Norman, but it exhibits examples of transition, early English, decorated English and perpendicular styles. The most commanding feature is the west front, consisting of three magnificent pointed arches 80 feet high, surmounted by pediments and pinnacles. and flanked by turrets with spires and pinnacles. The whole front forms a square of 150 feet in height and breadth. Catharine of Aragon, wife of Henry VIII, was interred in this cathedral. The building has recently undergone extensive repairs and restorations. The minster precincts show the remains of a cloister, a fine perpendicular gateway leading to the deanery, a massive tower and gateway conducting to the bishop's palace, and an old chapel, now used as a museum. Other public buildings are seven churches, a number of Nonconformist chapels, the townhall, corn exchange, county court offices, several banks and a post-office. There is a training college for Church of England schoolmasters, grammar-school, middle-class school, etc. There are also an infirmary and dispensary and monastic almshouse. Pop. 33,574.

PETERHEAD, pē-tėr-hĕd', Scotland, a seaport town in the county and 32 miles by road north-northeast of Aberdeen, on a peninsula, the most easterly point of Scotland, with a harbor on either side of it, communicating by a cut across the isthmus. A great harbor of refuge is being constructed by convict labor. The town has several churches, a town-hall with a spire 110 feet high, free library and museum, a market-cross, a customhouse, excellent schools, a convict prison, public baths, municipal lodging-house, etc. There are a woolen factory and granite-polishing works. The town has a considerable trade. The Greenland whale and seal fisheries, once of importance, have all but ceased; but the town is still an important centre of the herring-fishery. Some miles from the town are the ruins of the castles of Ravenscraig and Inverugie, the latter once the seat of the Keiths, earls-marischal of Scotland. There is at Peterhead a statue (presented to the town by William I, emperor of Germany) of James Keith, field-marshal in the Prussian service, who was killed at the battle of Hochkirch in 1758. Pop. 13,559.

PETERHOF, pä'tĕr-hōf, Russia, a town on the Gulf of Finland, 18 miles west of Saint Petersburg, noted for an imperial summer palace built by Peter the Great in 1711. It contains a fine collection of paintings and is surrounded by beautiful parks and gardens laid out on the model of those at Versailles, with cascades, terraces and summer houses. Population estimated at 15,000.

PETERKIN, George William, American bishop: b. Clearspring, Md., 21 March 1841. He received his education at the University of Virginia and at the theological seminary of Virginia. From 1861–65 he served in the Confederate Army, becoming first-lieutenant and adjutant to Gen. W. A. Pendleton of the Army of Northern Virginia. He then assisted his father in his duties at Saint James Church, Richmond, Va. (1868); was rector of Saint Stephen's Church, Culpeper, Va. (1869); Memorial Church, Md. (1873). In 1893 he organized a mission in Brazil, in Porto Rico in 1901. He founded the Sheltering Arms Hospital in 1886. He has been first bishop of West Virginia since 1878. Among his publications are 'Records of Protestant Episcopal Church in Western Virginia and West Virginia'; 'Handbook for the use of Members and Friends of the Protestant Episcopal Church,' and various other articles.

PETERMANN, pä'tĕr-män, **August Heinrich,** German geographer: b. Bleicherode, Prussian Saxony, 18 April 1822; d. Gotha, 25 Sept. 1878. He learned his art at the Potsdam School of Geography. His first important work in cartography was a map for Humboldt's 'Central Asia.' In 1845 he went to Edinburgh and assisted Keith Johnston in the preparation of his 'Physical Atlas,' and in 1847 went to London, where he became a member of the Royal Geographical Society and contributed to the 'Encyclopædia Britannica,' etc. Queen Victoria appointed him "Physical Geographer Royal." In 1854 he became professor of geography at Gotha and superintendent of Justus Perthes' geographical establishment, editing for 14 years 'Petermann's Mitteilungen,' which he founded in 1855, the foremost among the geographical magazines. He traveled extensively in the Orient and wrote of his travels. He was associated with Hübner in important discoveries in chemistry and provings of the atomic theory.

PETERS, pē'tėrz, or **PETER, Hugh,** English Puritan Clergyman: b. Fowey, Cornwall, June 1598; d. London, 16 Oct. 1660. He was educated at Cambridge, took orders and preached with much acceptance at Saint Sepulchre, London, for a time but was presently imprisoned for non-conformity by Archbishop Laud. On being released he went to Rotterdam and from about 1632 was minister of an independent congregation there. In 1635 he came to New England and in December 1636 was ordained pastor of the First Church in Salem, Mass., in succession to Roger Williams, whose followers he excommunicated. In 1637 he was made an overseer of the newly established Harvard College. He proved himself to be a public-spirited citizen, was active in civil and commercial affairs and in March 1638 was appointed to assist in collecting and revising the laws of the Massachusetts Bay Colony. He was sent to England in August 1641, with two others, to obtain revision of the laws of trade and excise, in which commission they were successful. Peters then joined the Parliamentarians, became a chaplain in the army, is said to have held a colonel's commission and was a valuable asset to the popular cause. He had intended to return to America, but various matters prevented and during the Protectorate he was a zealous supporter of Cromwell, on whose death he preached a sermon from the text «My Servant Moses is Dead.» At the Restoration he was exempted from the Act of Indemnity, sent to the Tower and indicted for high treason as having been concerned in the death of Charles I. He was able to prove false the rumor of his having been present on the scaffold at the king's execution, but was found guilty of treason and was beheaded at Charing Cross. His private character, as was the fashion of the time, was the subject of much attack and the grossest immorality was charged against him, without any solid basis. He appears to have been honest and high-minded, but given to violent denunciations of his opponents and wanting in judgment. His writings are mainly political pamphlets and sermons. Consult Peters, Samuel, ‘History of Hugh Peters’ (1807); Felt, ‘Memoir and Defense of Hugh Peters’ (1851); and ‘Dictionary of National Biography.’

PETERS, John Punnett, American Episcopal clergyman and archæologist: b. New York, 16 Dec. 1852. He was graduated from Yale in 1873. He took his doctorate in 1876 and was instructor until 1879. He entered the ministry of the Episcopal Church in 1876, studied in Berlin and Leipzig (1879–83), was in charge of Saint John's Church, Dresden, Germany (1881–83). He became professor of Old Testament languages and literature in the Episcopal Divinity School, Philadelphia, in 1884; of Hebrew, University of Pennsylvania in 1885 and was in charge of the expedition of that university which conducted excavations at Nippur (1888–91) unearthing the great temple of En-lil and discovering the oldest cuneiform inscriptions known up to that time, carrying back the records of civilization a millennium or more. In 1891 and again in 1901, he traveled and explored in Palestine. Since 1893 he has been rector of Saint Michael's Church, New York, was canon residentiary, Cathedral of Saint John the Divine (1904–10) and has been very active in civic and social work in New York City. He received the honorary degree of D.D. from Yale in 1895 and of Sc.D. from the University of Pennsylvania in the same year. He is the author of ‘Political History of Recent Times’ (1883); ‘Scriptures Hebrew and Christian’ (English edition); ‘The Bible for Home and School’ (1886–89); ‘The Bible as Literature’ (1896); ‘Nippur, or Explorations and Adventures on the Euphrates’ (1897); ‘Diary of David McClure’ (1899); ‘Archeological History of Hither Asia’ (1899); ‘The Old Testament and the New Scholarship’ (1901); ‘Labor and Capital’ (1902); ‘Early Hebrew Story’ (1904); ‘Some Tombs in the Necropolis of Marissa’ (1905); ‘Annals of Saint Michael's’ (1907); ‘Modern Christianity’ (1909); ‘Jesus Christ and the Old Commandments’ (1914); ‘The Religion of the Hebrews’ (1914).

PETERS, pā'tĕrs, **Karl,** German explorer: b. Neuhaus, Hanover, Germany, 27 Sept. 1856; d. 17 Oct. 1918. He was educated in Göttingen, Tübingen, London, and Berlin. For a few years he devoted himself to teaching. In 1884 he founded the German Colonization Society and led an expedition to Central Africa, where he raised the German flag in Usagara, Ukami, Nguru and Useguha. He was granted the first Imperial Charter in German history; founded German East Africa in 1885; and continued his management of the colonial possessions until 1888, meanwhile annexing more territory in East Africa. In 1889–90 he led the German relief expedition in search of Emin Pasha and in 1890 reached Victoria Nyanza, after crossing which he met Emin Pasha with Stanley. In 1891–93 he was imperial high commissioner for East Africa and succeeded in establishing the boundary line between English and German possessions. He was attached to the colonial office of Berlin in 1893–95 and in 1896 was accused of cruelty in his treatment of the natives of Africa and recalled. The subsequent investigations resulted in his dismissal. He went to London, founded an exploration company, and in 1899–1901 explored the region between Zambosi and Sabi, where he made important discoveries of ruins which throw much light on ancient African history, and also found gold and copper mines. He has written extensively concerning his travels, his ‘New Light on Dark Africa’ has been published in nine languages and among his other publications are ‘Willenswelt und Weltwille’ (1883); ‘Deutschnational’ (1887); ‘Die deutsche Emin Pascha Expedition’ (1891); ‘Æquatorial und Südafrika nach einer Darstellung von 1719’ (1895); ‘Im Goldlande des Altertums’ (1902); ‘Forschungen swichen Sambes; und Sabi’ (1902); ‘England und die Engländer’ (1905); ‘Die Gründung von Deutsch-Ostafrika’ (1906); ‘Zur Weltpolitik’ (1912); ‘Afrikanische Köpfe’ (1915).

PETERS, Madison Clinton, American Baptist clergyman: b. Lehigh County, Pa., 6 Nov. 1859; d. 12 Oct. 1918. He worked his way through school and college. At 16 he was a teacher, preaching on Sundays and lecturing through the week. For a year he attended Muhlenberg College, at Allentown, Pa., and then went to Franklin and Marshall College, Lancaster, Pa., and Heidelberg Theological Seminary, Tiffin, Ohio; entered the ministry of the Reformed Church in 1880, his first charge being in Indiana. He went from there to Ottawa, Ill., where he achieved a great reputation as a popular preacher. In 1884, when but 24 years of age, he was called to the Old First Presbyterian Church of Philadelphia. Here he increased his reputation, building up a regular congregation of 1,500. During the five years of his service there he lectured continually not only in Philadelphia but also in many distant cities. In 1889 he went to New York to become pastor of the Bloomingdale Church, Broadway, New York, where he remained for 11 years. He then adopted the Baptist faith and became pastor of the Sumner Avenue Baptist Church, Brooklyn, resigning in 1906. For two years following he was pastor of the Church of the Epiphany in New York. Besides being a prolific contributor to newspaper syndicates he has published 'Justice to the Jew' (1899); 'Wit and Wisdom of the Talmud' (1900); 'Sanctified Spice' (1895); 'Why I Became a Baptist' (1901); 'The Man Who Wins' (1905); 'After Death — What?' (1908); 'The Mission of Masonry' (1913); 'Seven Secrets of Success' (1916); 'America for Americans' (1916); 'The Masons as Makers of America' (1917); 'All for America' (1917), and others.

PETERS, Richard, American jurist: b. near Philadelphia, 22 Aug. 1744; d. there, 21 Aug. 1828. He was educated in Philadelphia studied law and was admitted to the bar in 1763. In 1771 he became register of the admiralty but left this post at the breaking out of the Revolution and was appointed captain of a company of volunteers. In June 1776 he was appointed by Congress secretary of the board of war. On resigning this office in 1781 he was elected a Member of Congress for the term 1782–83. In 1787 he was member of the State assembly, and was its speaker from 1788 to 1790. In 1791 he was speaker of the State senate, and after the organization of the government he accepted in 1792 the office of judge of the United States District Court for Pennsylvania, a position which he retained for the rest of his life. The admiralty law of the United States may be said to owe to him its foundation. He was also eminent as an agriculturist, and was president of the Philadelphia Agricultural Society. His great estate of 200 acres, known as «Belmont,» is now a part of Fairmount Park in Philadelphia.

PETERS, Samuel, American clergyman: b. Hebron, Conn., 12 Dec. 1735; d. New York, 19 April 1826. In 1757 he was graduated at Yale and traveled in Europe the following year. In 1759 he took orders in the Church of England in London and in 1762 took charge of churches in Hartford and Hebron. He imitated the style of an English nobleman in his house, kept a coach, and looked with scorn upon Republicans. «In his domestic and private relations he was all that could be desired.» The Whigs accused him of communicating with England, and a committee, accompanied by an assemblage of 300 persons, visited him in August 1774, and obtained from him a written declaration that he had not «sent any letter to the bishop of London, or the venerable society for the propagation of the gospel, relative to the Boston port bill, or the tea affair, or the controversy between Great Britain and the colonies, and design not to, during my natural life, as these controversies are out of my business as a clergyman.» He gave them also a copy of the «Thirteen Resolves» which he confessed that he had written for the press. He was again visited by the people in September and compelled to sign another declaration. Soon afterward he fled to Boston with the intention of sailing for England to make a representation there of his treatment. It was feared that he would procure a withdrawal of the charter of Connecticut, and his letters were intercepted. One dated 1 Oct. 1774, and addressed to Rev. Samuel Auchmuty, of New York, proposed that Connecticut should be divided between New York and Massachusetts. Dr. Peters obtained a pension and a grant for his property that was later confiscated by the Americans, but, owing to a quarrel with William Pitt, he lost this about 1803. In 1794 he was chosen bishop of Vermont by a convention of that diocese, but the archbishop of Canterbury refused his consecration on the ground that the number of bishops for America was limited. In 1805 he returned to the United States and traveled to the Falls of Saint Anthony (Minneapolis, Minn.), where he obtained from a Captain Carver a grant of a tract of land 100 miles square. He spent several years in Washington petitioning Congress for a confirmation of this grant. In 1818 he settled in New York City, where he lived in obscurity and on charity. He wrote a 'General History of Connecticut, by a Gentleman of the Province' (London 1781; 3d ed., New Haven 1829). This contains numerous anecdotes and is a satire on the colony, written during Peters' stay in England during the Revolution. In this book he includes the story of the «Blue Laws» of the New Haven colony, which until recently were branded as pure fabrications. It is now known that of the 45 laws included only two or three are pure inventions, the others having existed in one form or other in the colonies although the most extreme were never enforced. Consult Prince, 'Examination of Peters' Blue Laws' (in 'Report of the American Historical Association' 1898), and Trumbull, 'The Rev. Samuel Peters: His Defenders and Apologists' (Hartford 1877).

PETERS, William John, American explorer: b. Oakland, Cal., 5 Feb. 1863. He was educated at Oakland High School and from 1885 to 1897 was engaged in various surveys for the United States government. In 1898–1902 Mr. Peters had charge of the Alaskan explorations made by the United States Geological Survey, accounts of which appear in the publications of that bureau. He was appointed official representative of the National Geographic Society on the Ziegler Polar expedition to Franz Joseph Land in 1903–05 and in 1907–13 was in command of the magnetic survey ships *Galilee* and *Carnegie.* His published works deal with the results of his exploration work.

PETER'S PENCE (Romescot, Rom-gesceot, Rom-feoh, Denarius S. Petri, The King's Alms, Hearth-money). Anciently, an annual tribute of one penny for every household, collected in England and other countries of Christendom, and paid to the Holy See; in modern times, a yearly voluntary contribution made by Catholics, through their bishops, for the maintenance of the Sovereign Pontiff. Several theories are advanced as to its origin. It appears, however, to be beyond reasonable doubt that the tax was inaugurated by Ina, King of Wessex, about the year 727. Writes Roger of Wendover (1237): «In the year of grace 727, the fortunate and powerful King Ina left his kingdom to his kinsman, Athelhard, and went to Rome that he might exchange a temporal for an eternal kingdom. On his arrival, with the consent and approbation of Pope Gregory, he built a house in the city which he called the English School to the end that when the kings of England, and the royal family and the bishops, presbyters, and clergy came hither to be instructed in the Catholic faith and doctrine, nothing heterodox or contrary to Catholic doctrine might be taught in the English church, and that they might return home confirmed in the faith. . . . He built moreover, nigh to the aforesaid house, a church in honor of the Blessed Virgin Mary, wherein the divine mysteries might be celebrated for the English who came to Rome, and in which they might be buried if any of them chanced to die in Rome. And to give strength and perpetuity to all this, it was ordered by a general decree, throughout the entire kingdom of the West Saxons, in which the aforesaid Ina reigned, that, every year, one penny, which in English is called Romescot, should be sent by every family for the blessed Peter and the Roman Church, that the English who sojourned there might be furnished with the necessary subsistence.» ('Flowers of Hist.,' tr. Giles, 1849, Vol. 1, p. 137. Comp. 'Cronica Ranulphi Cestrensis Monachi, lib. v., c. 24, Caxton, 1482). Offa, king of Mercia, according to the same chronicler, augmented this revenue (793) by granting «the blessed Peter's penny . . . . which the English call Romescot,» to be paid, each year, throughout the 23 shires subject to him, by each family that had possessions in lands yielding rental annually to the value of 30 pence (ib. pp. 163, 164). In the 9th century, Ethelwulf «offered to God and to Saint Peter an annual tax of a silver penny to be paid by each house in England; this tax is now known under the name of Peter's Pence.» (William of Malmesbury, Gesta Regum, ii, 2). At the request of Alfred the Great, son of the former, the Pope freed the English school from all tribute and tax, and the Romescot was contributed by both the king and the people for a new and twofold object, part for the Pope's personal use, and part to keep up the light in the churches of Saint Peter and Saint Paul. ('Monumenta Historiæ Britannicæ' ed. Petrie and Sharpe, p. 472. Comp. ib., p. 552, p. 517, C.). In 1027 King Knut wrote from Rome to the English clergy and laity, and in his letter mentioned «the pennies which we owe at Saint Peter's, Rome,» as among the things «we owe to God, according to ancient law.» (Monumenta Historiæ Britannicæ, p. 597). Considerable irregularity arose, from time to time, in the levying of the Peter's Pence. At times, it was interrupted through misunderstandings and quarrels with the Holy See; sometimes, portions of it were withheld or the sum total forwarded only after several years. No regular payments were made after 1343. King John, in 1199, when he swore fealty to the Pope, expressly promised that in addition to the payment of the sum of 1,000 marks a year the payment of the Peter's Pence should be continued. Edward II in 1307 undertook to collect the arrearages and pay them in instalments. Some English monarchs, however, notably Edward III, in his address to Parliament, 21 Jan. 1365, objected to the collection of the Romescot. Finally in 1366 it was abolished by law. (Lingard, 'History of England,' Vol. III, p. 41, note). Suppressed by statute 25th Henry VIII, ch. 21, in 1534, it was revived by Mary, and finally abolished in England under Elizabeth.

The Peter's Pence tribute is said to have been introduced into Denmark and Norway by Knut, into Sweden by Olaf, into France by Charlemagne, and into Poland under Casimir I. It was extended to Ireland in 1154, through the much-discussed bull of Adrian IV. It was paid in Scotland, Bohemia and Spain. That toward the end of the 11th century the payment of this tribute implied, in Continental countries, the acknowledgment by the various sovereigns of a kind of suzerainty or temporal protectorate on the part of the Apostolic See, is certain. (Fabre, 'Étude sur le Liber Censuum de l'Eglise Romaine'). And there can be little doubt that after the original object of the Romescot — the support of the English School — had no longer to be met, the same condition obtained also in England. (Rivington, 'Rome and England,' p. 47). When Henry VIII broke with the Holy See, and the Peter's Pence was prohibited by act of Parliament, this latter took place «on the grounds,» writes Gairdner, «that the realm was not subject to any power outside of it». ('History of the English Church,' p. 145).

The Peter's Pence tribute was collected in midsummer on the days which intervene between the feast of Saints Peter and Paul and the feast of Saint Peter's Chains. The value of the penny varied considerably. In the time of Henry II it amounted to one dollar or a little more of our money. (Malone, 'Church History of Ireland,' 1880, p. 26, note). The annual sum forwarded in the time of King John was £199 8s., according to Lingard, who took the figures, with the amount for each of the 15 dioceses which paid it, from the 'Authentic Register of Innocent III,' in the Vatican Library. ('History of England,' Vol. III, p. 41, note). Some of the coins are still in existence. The English penny was of fine silver, 240 to the pound weight. In the latter days of the tax, the tokens appear to have been manufactured in every cathedral town. On the one side they have the inscription Sci. Petri M. (Sancti Petri Moneta); on the other the name of the place of minting. The Poles, who kept up the impost for about three centuries, paying within that period not far from half a million florins, used a coin for the purpose which was a base mixture of copper and silver. On one side was stamped the image of the Polish eagle; on the other, that of Saint Peter with a key.

The modern Peter's Pence is used by the Pope for the current expenses of his administration. A voluntary offering, inaugurated through the efforts of M. de Coux and Louis Veuillot, editors-in-chief of the *L'Univers*, in September, 1847, its purpose was to relieve a condition of embarrassment then prevailing in the papal finances, as well as, in a practical way, to demonstrate the devotion of Catholics to the Holy Father. One hundred francs for the Pope, deposited at the office of the paper by an anonymous benefactor, was made the occasion of a movement which almost immediately received the indorsement of Cardinal de Bonald, many bishops and the whole Catholic press. In a short time the subscription became general throughout France. (Veuillot, Eugene, 'Louis Veuillot,' Paris, 1901, t. II, pp. 195–198). From France it spread into other countries, especially on the seizure of the papal provinces, at which time the contributions reached the sum of $4,000,000 in the year — the highest figure on record; it is now observed by Catholics everywhere. In 1868 the second plenary council of Baltimore decreed that collections for the Pope be taken up annually in all churches of the United States on the Sunday within the octave of Saints Peter and Paul, or at any other opportune time, that the total sum collected be sent, either directly by the bishops themselves or through the metropolitan of each province, to the Sovereign Pontiff. (Cl. P. B. II, n. 48). The pastoral letter of the archbishops and bishops of the third plenary council in 1884 praises the liberality of the people in the collection for the Holy Father "which will continue to be made annually throughout all the dioceses of the country." (Cl. P. B. III, p. 77).

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PETERSBURG, Alaska, town on the island of Mitkof. Fishing and lumbering are the chief industries. The town has been incorporated and numbers 1,000 souls.

PETERSBURG, Ill., city and county-seat of Menard County, on the Sangamon River, and on the Chicago and Alton and the Chicago, Peoria and Saint Louis railroads, 20 miles northwest of Springfield. It contains a public library, high school, a monument to Stephenson, founder of the G. A. R., flour mills, canning establishments, brick yards, etc. The water-supply system is municipally owned. Pop. 2,587.

PETERSBURG, Ind., town and county-seat of Pike County, on the Chicago and Eastern Illinois Railroad, 40 miles northeast of Evansville. Here are located Old Indian Fort and the Thornton Home for Orphan Children. There are coal mines, gas and oil wells nearby and there is a large trade in these commodities. The town has flour mills, brick and tile yards, lumber yards, etc. Agriculture and stock raising give employment to great numbers. The town owns the water-supply system. Pop. 2,170.

PETERSBURG, Va., city, port of entry, in Dinwiddie County, on the south bank of the Appomattox River, the upper Appomattox Canal, and on the Atlantic Coast Line, the Seaboard Air Line, and the Norfolk and Washington railroads, 22 miles south of Richmond. It is an agricultural region in which tobacco is the chief product, and at the northern end of the great peanut belt, and is the controlling peanut market of the country.

Where Petersburg now stands was once the site of an Indian village, which was destroyed by Nathaniel Bacon in 1676. Petersburg was founded by Peter Jones in 1733, incorporated as a town in 1784, and in 1850 was chartered as a city. It was the scene of several engagements during the Revolutionary War, and twice it was occupied by British troops under General Philips. In the War of 1812, and in the war with Mexico, Petersburg sent her full quota to the front. During the Civil War, it was the scene of many of the engagements of the famous Virginia Campaign. East of the city, on Griffith's farm, is a small museum, containing many relics of the war, principally from the old crater which is on this farm. See PETERSBURG, MILITARY OPERATIONS AGAINST.

Petersburg, although an important manufacturing centre, is a residential city of peculiar charm, with many stately mansions in spacious grounds. It has two well-kept parks; supports three prosperous banks; and has 10 miles of street railway. In 1916 the real estate of the city was valued at $11,428,865, and the personal property at $8,820,465. The prominent public structures are the Y. M. C. A. building, Masonic Temple, Odd Fellows' and Red Men's buildings and the municipal buildings. It is the site of the State Central Hospital for the Colored Insane, with 1,000 patients, a Home for the Sick and the Benevolent Mechanics' Association. The educational institutions are the Virginia Normal and Collegiate Institute, for colored students; the Petersburg Academy for young men, the Southern Female College; Saint Joseph's School; 11 private academic schools of high grade; public and parish schools and the library and museum of the Mechanics' association.

Owing in part to its excellent water power, besides its unusual transportation facilities, and the abundance of raw materials, Petersburg's manufacturing interests are many and various. In 1916 the city had 290 factory establishments, employing over 6,000 hands, who received $1,750,000 in the year's wages. The output was valued at $11,000,000. The five cotton mills consume annually 10,000 bales of cotton and produce 11,000,000 yards of cloth and upward of 100,000 pounds of thread and yarn; much of which is exported direct to China and Central America. One of the flour mills has a yearly output of 40,000 barrels, and the four corn mills grind a million bushels of corn annually. The yearly lumber export is 50,000,000 feet, cut in the surrounding forests. The trunk factories turn out daily 1,200 trunks and 1,500 handbags. The tanbark mills grind between 5,000 and 6,000 tons of bark, and 3,000 tons of sumac leaves. Other industries include the making of fruit baskets and crates in enormous quantities, veneer and wheels; shipyards, which build not only the hulls, but the engines also; foundries and machine shops; a silk factory; brick works, etc. The government is administered under a charter of 1875 which provides for a mayor, who holds office four years, and a council. The voting population numbered, in 1916, 3,582 whites and 2,187 colored. The annual water commerce of the port aggregates 200,000 tons. The city owns and operates the waterworks. Pop. 26,500.

PETERSBURG, Military Operations Against. When General McClellan, in the summer of 1862, was forced to abandon his advance upon Richmond by way of the Peninsula and fall back to Harrison's Landing, he proposed to cross to the south side of James River and operate against Richmond by that side, seizing Petersburg and the railroads leading to that city and Richmond from the south, and for this purpose asked that his army be largely reinforced. General Halleck, commander-in-chief of the army, disapproved the movement and withdrew the Army of the Potomac from the Peninsula. No further effort was made for a serious advance south of the James until early in May 1864, when, in co-operation with the campaign beginning in the Wilderness, General Grant ordered General Butler, commanding the Army of the James, to cross to the south side of the river and, moving close along its bank, press for Richmond. Butler was stopped at Drewry's Bluff (q.v.), and held to his intrenchment at Bermuda Hundred. On 9 June Butler ordered General Gillmore and General Kautz to capture Petersburg and destroy the railroad bridge across the Appomattox. On the morning of the 10th Gillmore, with 1,800 men arrived before the Confederate works on the City Point road, General Hinks, with 1,200 men coming up a mile to his left. Both thought the works too strong to be carried, and withdrew. Kautz, with 1,500 cavalry, planning to strike the city from the south, moved up by a circuit over the Jersualem plank-road, four or five miles to Gillmore's left and, near noon, made three unsuccessful attacks, then turned the Confederates in his front, and advanced close to the city waterworks, on Reservoir Hill, where he found infantry and artillery intrenched, and, believing that he could not capture the city, withdrew, followed by Dearing's Confederate cavalry brigade. At this time Petersburg was held by about 2,400 infantry under General Wise, Dearing's cavalry, and some local militia.

After the loss of 53,400 men in his campaign from the Wilderness to Cold Harbor, in an effort to reach Richmond from the north, General Grant concluded to transfer his army to the south of James River and conduct operations against Petersburg and Richmond similar to those proposed by McClellan two years before. General Halleck objected, advocating an investment of Richmond from the north, but Grant adhered to his own plan, sent Sheridan to destroy the railroad north and west (see Trevilian Raid and Battle of Trevilian Station), and began preparations to withdraw from before Lee at Cold Harbor and cross to the south of the James. The general movement began on the 12th and was skilfully conducted; and crossing the Chickahominy and then the James, at and near Wilcox's Landing, the entire Army of the Potomac was south of the river, in rear of Bermuda Hundred, at midnight of the 16th.

First Assault.— Before all the Army of the Potomac had crossed the James, Grant ordered an advance on Petersburg for 15 June. The Petersburg intrenchments ran from the Appomattox River east a mile to the City Point Railroad; then south three miles to Norfolk Railroad; then west four miles to a point a mile west of the Weldon Railroad; then north two miles to the Appomattox. The length of the intrenchments from the Norfolk Railroad west to the Jerusalem plank-road was one and one-half miles. These works 15 June were held by General Wise's infantry brigade of 2,400 men, General Dearing's cavalry brigade of 3,500, and a small body of local militia. Gen. W. F. Smith, who had rejoined the Army of the James at Bermuda Hundred on the night of the 14th and next morning with his infantry division increased to 13,700 officers and men, and Kautz's division of 2,400 cavalry marched along the City Point Railroad and wagon-road. General Hinks' negro brigade capturing two guns and a line of rifle pits. When he came under fire of artillery, he reconnoitered and formed his troops for assault. Ignorant of the comparatively slender force behind the works, his reconnoissance was deliberate and prolonged, and it was 5 P. M. when he concluded not to assault in column under a heavy artillery fire that had been opened upon him, but to use his own artillery against one of the Confederate redoubts and to attack the Confederate works with a strong skirmish-line. When he was ready for the movement it was found that all the artillery had gone to the rear to water the horses, and there was a delay of an hour or more. About seven o'clock the guns opened, the skirmishers advanced, by nine o'clock one and one-half miles of the Confederate intrenchments had been taken, and with them 16 guns and nearly 400 prisoners. These captures laid the city open to an unobstructed advance, as no other works then existed and no reinforcements had yet been sent. General Hancock, commanding the Second corps, had been ordered to march on Petersburg on the morning of the 15th after rationing his men; but neither he nor General Meade was informed of Smith's movement; there was delay in furnishing the rations; he started late in the morning without them; the position he was to occupy was incorrectly laid down on the maps, and it was not until 5 P.M. that he was notified to hasten to Smith's assistance. In fact this was the first inkling that Hancock had that there was any intention to attack Petersburg on that day. It was dark, though bright moonlight, when he came to Smith's position, and, at Smith's request, relieved his troops. Had there been a proper understanding that day between Meade, Hancock and Smith, Petersburg would have been taken before night, and a weary, wasting 10 months' siege avoided. During the night nearly the whole of Lee's army was poured in from every quarter between Petersburg and the sleeping Federals. Hoke's division was sent by Beauregard to form on Wise's left and extend to the Appomattox. B. R. Johnson's division was withdrawn from the Bermuda Hundred line and early on the 16th took position on Hoke's right. Wise's right was still half a mile from the Jerusalem plank-road. From Wise's right to Hoke's left, a distance of five miles, the Confederates had, on the 16th, besides artillery, about 14,000 men. When daylight came the attacking force found a new line of earthworks before the city, manned by the best of Lee's veterans. On the morning of that day Egan's brigade of Hancock's corps attacked and carried a Confederate redoubt. Burnside's Ninth corps came up at 10 A.M. and formed on Hancock's left. The

Union troops now fronting Beauregard's 14,000 numered 53,000 men. At 6 P.M. Hancock assaulted with the Second corps, supported by two brigades of the Eighteenth on the right and two of the Ninth on the left. Three redoubts and their connecting works were carried. The Union loss was severe. B. R. Johnson's withdrawal from the front of Butler's right had been discovered during the night of the 15th, and early next morning General Terry advanced, captured some pickets and, after sharp resistance, occupied the main line of Beauregard's intrenchments, taking many prisoners. Meade had been ordered to attack with artillery at 6 P.M. At the same hour Pickett's division, sent by General Lee from Drewry's Bluff, drove in Terry's skirmishers, and Terry abandoned the captured works, which were reoccupied by Pickett, who, advancing from them, attacked Terry and was repulsed. On the 16th General Ledlie, sent to relieve Potter's troops, advanced to within one and one-half miles of the city into which he threw shells. On the morning of the 17th the Second and Ninth corps under General Potter again assaulted the Confederate works, carrying portions of them and taking four guns and 400 prisoners. Meanwhile Warren's Fifth corps had come up and formed on the left of the Ninth. Another assault was made in the afternoon by the Second, Ninth and Fifth corps, and continued until after dark, with heavy losses on both sides, but the advantage remained with the Union troops, who had gained several important positions. During the night Beauregard withdrew across a ravine, formed a new line from 500 to 1,000 yards in rear of the one he had been occupying, and immediately intrenched it. General Meade ordered a general assault for the 18th, which was made by piecemeal and repulsed, but the ground gained, close up to the Confederate works, was intrenched, and on this part of the field the two opposing lines remained substantially the same in position to the close of the war. In these attempts to carry Petersburg by assault 10,000 men had been lost; it was now known that Lee's entire army was being thrown into the place; Meade said there was "nothing further to be gained by direct attacks"; and Grant ordered that no more assaults be made and determined to invest the place partially by extending his left across the Weldon Railroad and to the South Side Railroad.

Petersburg.— General Grant having decided that a siege was necessary to reduce Petersburg, ordered strong works to be thrown up close to those of the Confederates; close connection was made with the Army of the James on the right; and the first offensive movements were to destroy communication with Petersburg on the south. On 22 June General Wilson, with 5,500 cavalry and 16 guns, marched to destroy the Petersburg and Weldon Railroad and the South Side Railroad (see WELDON AND SOUTH SIDE RAILROAD, WILSON'S RAID ON), and on the same day the Second and Sixth corps made an effort to seize the Weldon Railroad near Globe Tavern, but were severely checked by A. P. Hill's Confederate corps when about a mile from the road. (See JERUSALEM PLANK-ROAD, ENGAGEMENT NEAR). Being reinforced by Meade at sundown, both corps advanced, retaking the lost ground. Hill was obliged to withdraw with his 2,500 prisoners, and the cutting of the Weldon Railroad was accomplished. Meanwhile, Kautz and Wilson, with 8,000 cavalry, cut the railways south of Petersburg over an area of 22 miles, and then pushed on, against strong opposition to Burke's Station at the junction of the Southside and Danville railroads. Both of these roads were thoroughly torn up; and then these commanders attempted a circuit to strike the Weldon Railroad. They were met by Hampton's cavalry and supporting infantry, and repulsed with heavy losses; and were compelled to retreat to the position before Petersburg. Both armies remained comparatively quiet for more than a month, intrenching and throwing up redoubts, but there was incessant skirmishing all along the lines, with severe losses. On 25 July Grant ordered a movement north of the James to threaten Richmond and thus draw from Petersburg a part of Lee's army to give more likelihood of success in a proposed explosion of a mine in front of his army on the Petersburg line and a subsequent assault. This movement resulted in the battle of Deep Bottom (q.v.), and the transfer by Lee of five infantry and two cavalry divisions to the north side of the James, thus reducing the force south of it to three divisions of infantry and one of cavalry.

Petersburg Mine.— In the latter part of June Lieutenant-Colonel Pleasants, 48th Pennsylvania, suggested to General Potter, his division commander, the mining of a Confederate redan in his front, and agreed to conduct the operation. General Burnside authorized it to be done, and General Meade, though not having much faith in it, assented. The redan was held by Elliott's brigade of B. R. Johnson's division, and was opposite the centre of the Ninth corps, where the opposing lines were not more than 120 yards apart. Pleasants had many difficulties to overcome, but the work was finished ready for charging by 23 July. The main gallerv was 511 feet long, with two lateral galleries of 37 and 38 feet, in which were eight magazines, each charged with 1,000 pounds of powder. It was intended that, upon the explosion of the mine, the artillery on the right and left should open a furious fire, and that two brigades of General Ferrero's colored division should lead in the assault upon the wrecked work; but as these troops had never been under close fire of the enemy, Generals Meade and Grant objected, and Burnside substituted General Ledlie's division. The whole army was held in readiness to advance and take any advantage gained by the confusion anticipated in the Confederate lines. The order for the attack was issued by General Meade on the 29th, and was full and precise as to what was to be done by each commander. Burnside was to spring the mine at 3.30 in the morning of the 30th; his guns were to begin at once a bombardment of the whole line, and of Cemetery Hill, 400 yards in the rear of the mined works; his assaulting columns were to rush forward, seize a crest of ground 150 yards beyond the breach in the line caused by the explosion, reform and push on, closely followed by General Ord's corps on the right and by General Warren's on the left. The fuses failed, however, and had to be relighted after half an hour's delay and it was 4.40 when the explosion occurred, carrying men, guns, carriages, dirt and timbers high into the air and leaving a crater 170 feet long, 60 feet wide and 25 to 30 deep. Burnside had failed to carry out the precise orders given him, the guns did their part accurately and with effect, but there was delay and confusion in getting the charging columns over his own works. Ledlie's division, without its commander, moved into the crater and halted, filling it with a confused mass. A corps of negro troops had been selected for this movement but General Grant objected and Ledlie's force was substituted. Anticipating a storm of artillery fire from the works beyond, it did not go forward; was not promptly supported; other troops rushed into the crater and added to the confusion. The Confederates were silent for a full half hour, and then, recovering from their first surprise, reoccupied the intrenchments they had abandoned on the right and left; swept the crater with canister; and shortly after noon the Union troops were ordered to fall back either during the day or under cover of night. Those in the crater were driven out or captured early in the afternoon, losing many in killed and wounded, though they had not much more than 100 yards to go to reach the intrenchments from which they had charged. General Grant says: "The effort was a stupendous failure . . . due to inefficiency on the part of the corps commander and the incompetency of the division commander who was sent to lead the assault." The Union loss was 504 killed, 1,881 wounded and 1,413 captured or missing; an aggregate of 3,798, of whom 3,475 were of the Ninth corps. The Confederate loss was not over one-third of that sustained by the Union troops.

Siege of Petersburg and Richmond.— On 30 July 1864 the armies of the Potomac and the James, investing Petersburg and Richmond, numbered about 59,000 effective infantry and 12,000 cavalry. General Lee had about 38,000 effective infantry and 8,300 cavalry. The Army of the Potomac undertook the investment of Petersburg, while the Army of the James held Bermuda Hundred and all the ground possessed north of James River. The Ninth corps was on the right of the Army of the Potomac at Petersburg, the Fifth in the centre, and the Second on the left. The Sixth corps had been sent to Washington to oppose General Early. To prevent General Lee from sending reinforcements to Early, Grant 12 August, ordered another movement north of the James to threaten Richmond, which resulted in the second battle of Deep Bottom (q.v.), in which the Union loss was over 2,700 men. Under cover of this movement Warren's Fifth corps, with a brigade of cavalry, moved to the left on the morning of the 18th and, after some hard fighting for four days, with heavy losses on both sides, succeeded in gaining and holding the Weldon Railroad at Globe Tavern, about four miles south of Petersburg. Thus clinching for Lee the loss of one of his most important lines of communication. (See GLOBE TAVERN, BATTLE OF). On the 22d General Hancock, with about 8,500 infantry and cavalry, moved to destroy the railroad south of Globe Tavern. By the 25th he had destroyed it as far down as Ream's Station and three miles beyond, 12 miles south of Petersburg when he was attacked by A. P. Hill and driven back with a loss of 2,700 men, 12 colors and 5 guns. Hill's losses were equally severe and he withdrew, having accomplished nothing, as Warren still held the railroad. (See REAM'S STATION, BATTLE OF). For a full month quiet continued along the lines. On 28 September, to retain Lee in his position, Grant having heard that only a few men were left to hold the Confederate lines north of the James, ordered Butler, who was at Bermuda Hundred, to send the Tenth (Birney) and the Eighteenth (Ord) corps, with Kautz's cavalry across the river and attempt to gain Richmond by a sudden attack before troops could be brought in to prevent it. The crossing was made at night on pontoon bridges muffled with straw. Birney crossed at Deep Bottom, and Ord at Aiken's Landing, eight miles above. Birney attacked the works on Spring Hill with colored troops. They took the position in a fierce engagement, losing one-third of their number. Ord's division attacked Battery Harrison, the strongest defensive works around Richmond. It was carried, though with desperate losses. (See FORT HARRISON, BATTLE OF). Further advance was prevented by the most obstinate resistance, and the Confederates made repeated efforts to regain the lost positions, but without success. Kautz's cavalry meanwhile had succeeded in reaching a point within three or four miles of Richmond, at the inner lines of defense, but was attacked and driven back. The affair was redeemed by the Tenth corps, and the Confederates retreated to Richmond after losing heavily. The two opposing lines north of the James maintained their relative positions to the close of the siege. In co-operation with this movement north of the James, Generals Warren and Parke, with two divisions each of the Fifth and Ninth corps and Gregg's cavalry division, moved 30 September to extend the intrenched line beyond the Weldon Railroad in the direction of the South Side Railroad. There was sharp fighting on 1 and 2 October, but the movement was checked after reaching the Weldon Railroad south of Globe Tavern, the Union loss being about 2,800, the Confederate loss about 1,000 (See POPLAR SPRING CHURCH, BATTLE OF). On 7 October Kautz's cavalry division of 1,700 men, holding the right of the Union line north of the James, was attacked by the Confederate infantry divisions of Field and Hoke and Gary's cavalry brigade, and driven back under cover of the infantry, losing 274 men and eight guns. Field's division followed in an attempt to turn the right of the line attacking the Tenth corps on the New Market road, and was repulsed with the loss of three brigade commanders and 700 men. On the 13th General Butler made a reconnoissance of the Confederate works on the Darbytown road, north of the James; one brigade made an assault upon them and was repulsed. On 27 October parts of the Ninth, Fifth and Second corps, together with Gregg's cavalry division, in all about 38,000 men, moved to the left to seize the bridge over Hatcher's Run and capture the Confederate works, which at that point Grant thought were not strongly held, the chief objective being the seizure of the South Side Railroad. The movement failed, and the troops were withdrawn with a loss of over 1,700, the Confederate loss being about the same. (See HATCHER'S RUN (BOYDTON ROAD), BATTLE OF). On the 27th and 28th General Butler made another movement on Richmond north of the James, by the Williamsburg, Charles City, and Darby roads. A severe engagement took place on the old battlefield of Fair Oaks or Seven Pines, in which Butler's forces were repulsed by Longstreet, and fell back to their camps near Fort Harrison, with a loss of about 1,100 men. On 6 December General Warren, with his own corps (Fifth), Mott's division of the Second, and Greggs cavalry, started on a raid against the Weldon Railroad, which was destroyed as far as Hicksford, on the Meherrin River, about 40 miles south of Petersburg. A. P. Hill was sent to intercept him, but failed to do so; and having completed his work, Warren returned to his camps.

Winter had now set in, and was of unusual severity, entailing much suffering upon both armies, but especially upon the Confederates, who were poorly fed and clothed. Lee strengthened his works and extended them up the south side of Hatcher's Run and where the Boydton plank-road crosses the run. A. P. Hill held the right from Hatcher's Run to Fort Gregg; Gordon and R. H. Anderson held from Hill's left to the Appomattox, and Longstreet from the Appomattox to the Confederate left, north of the James, at White Oak swamp. The length of the line was about 37 miles, eight of which were north of the James. To cover those 37 miles Lee had, 30 December, about 59,000 officers and men. At the same date Grant had about 110,000 men. With these he held Lee tightly to his works while armies elsewhere were carrying out his own comprehensive plans. On 5 February 1865 Grant put the greater part of his army in motion to the left to destroy Lee's communications, resulting in the battle of Hatcher's Run, Dabney's Mill, and Armstrong's Mill, and the extension of his intrenched line to the Run. The loss was about 1,000 to the Confederates and nearly 2,000 to the Union forces. The ford at Hatcher's Run was now securely in the hands of the Nationals and the City Point Railroad was promptly extended to that position.

General Lee had foreseen that the evacuation of Petersburg and Richmond would be forced upon him when Sherman approached from the south, and it was determined early in March that, as soon as the roads would admit of movement, the two places should be abandoned and his army moved to Danville to unite with Gen. J. E. Johnston and attack Sherman, and preparations were made accordingly. Meanwhile Lee proposed to make a sortie in order to gain some of the works on the right of the line held by the Army of the Potomac, near the Appomattox, and the ridge in their rear, with the expectation that this would oblige Grant to concentrate there by drawing in his left, and thus postpone the necessity for abandoning Richmond and Petersburg until the weather was favorable for falling back to Danville. To this President Davis gave his assent. General Gordon with about one-half of the army, was given charge of the movement, which was directed against Fort Stedman, on the Ninth corps line, where the opposing lines were only 150 yards apart, the pickets 50 yards apart. The chance was a hazardous one, but if successful the movement would have cut the National army in two and opened a gap for the escape of Lee's army. The assault was made at half-past four in the morning of 25 March, and was at first successful, the Confederates carrying the fort and works on either side of it; but after a hard fight of four hours they were driven back, with an estimated loss of 4,000 men and many colors. The Union loss was about 2,200. (See FORT STEDMAN, ASSAULT ON). Before this assault Grant had ordered a movement for the 29th to destroy the railroads leading into Petersburg from the south, force Lee to come out of his intrenchments and fight on open ground, or so far attenuate his line as to give chance for a successful assault. He had been joined by Sheridan and his cavalry from the Shenandoah Valley, and had under his command 101,000 infantry, 14,700 cavalry, and 9,000 field artillery, with 369 guns, an aggregate of 124,700 men. The Confederate army under General Lee numbered about 46,000 infantry, 6,000 cavalry and 5,000 field artillery, with about 190 guns, an aggregate of 57,000 men, or less than half of Grant's force.

The movement, which was the beginning of the end, began on the day fixed by Grant. Its object was to turn Lee's right with an overwhelming force. The greater part of the Army of the James was marched secretly on the night of the 27th from the right to the left of the Army of the Potomac, 36 miles, and on the morning of the 29th Sheridan's cavalry, with the Fifth and Second corps, moved to the left attacking the intrenchments at the junction of several roads from the north and south with the White Oak Road. The result was the battles of Dinwiddie Court-House and White Oak Road, on the 30th and 31st, followed by the decisive battle of Five Forks (q.v.) on 1 April.

Final Assault Upon Petersburg.— General Grant heard of the victory of Five Forks at 9 o'clock that night and ordered General Humphreys, commanding the Second corps, on the left of the general intrenched line, to "feel for a vulnerable point in the enemy's intrenchments, and, if one was found, to assault immediately." Humphreys assaulted before midnight, carried the picket-line, but was repulsed when he approached the main line. A general bombardment of the Confederate lines was kept up throughout the night and, under Grant's orders, at 4 A.M. of 2 April Ord's, Wright's and Parke's corps, about 63,000 men, assaulted the lines before which they had been held for 10 months, and which were now defended by less than 20,000 men. On many parts of the line there was desperate resistance, but the exterior lines were finally captured, Humphreys following up their successes by a new attack on his front, taking the redoubt which foiled him in the night attack. Lee thereupon sent word to President Davis that his lines were broken in three places, and that Richmond must be evacuated, and that he would hold on to his interior line until night, and then endeavor to reach Danville. At 3 P.M. Lee ordered a retreat, which began at 8 o'clock, the point of assemblage of his various columns being Amelia Court-House. Grant ordered a general assault for the morning of the 3d, but at 3 A.M. it was discovered that Lee had abandoned all his works. Petersburg was taken possession of by

Willcox's division of the Ninth corps, and at 8.15 A.M. Richmond was formally surrendered to General Weitzel, who had entered it from north of the James.

The Union loss in the final assault on Petersburg, 2 April, was 625 killed, 3,189 wounded and 326 missing. There is no record of Confederate losses. From 15 June 1864 to 9 April 1865 the campaign for Petersburg and Richmond cost the Union armies under General Grant 6,883 killed, 35,414 wounded and 20,859 captured or missing; an aggregate of 63,156 officers and men. The Confederate loss for the same period is not known.

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E. A. Carman.

PETERSEN, pā'tĕr-sĕn, **Niels Matthias**, Danish historian and philologist: b. Sanderup, island of Fünen, Denmark, 24 Oct. 1791; d. Copenhagen, Denmark, 11 May 1862. He studied philology and history, and in 1845 was appointed to the chair of Norse languages in the University of Copenhagen. He was an authority on mythology, geography and history, his specialty being the history of literature, and though some of his works have been superseded his 'History of Danish Literature' (1853–64) is still a standard. Among his books are 'Det Danske, Norske og Svenske Sprogs Historie' (1829); 'Oldnordiske Sagaer' (12 vols., 1826–36); 'Danmarks Historie i Hedenold' (1834); 'Den Nordiske Mythologi' (1849); 'Bemærkninger om Modersmaalet' (1853); 'Bidrag til den Danske Literaturs Historic' (5 vols., 1853–61); 'Bidrag til den old Nordiske Literaturs Historie' (1866), etc., all published in Copenhagen.

PETERSON, Frederick, American neurologist: b. Faribault, Minn., 1 March 1859. He was graduated from the medical department of the University of Buffalo, studied abroad and in 1882–83 was professor of general pathology and laboratory director in the University of Buffalo. In the latter year he removed to New York, where he practised as a nerve and brain specialist, and in 1893–94 was professor of neurology at the University of Vermont. He has been attending physician at various hospitals, was professor of neurology at the Woman's Medical College of the New York Infirmary, pathologist in the New York City Insane Asylum, president of the board of managers for the Craig Colony of Epileptics, chief of the clinic in the department of nervous diseases at Columbia, and in 1900 was made president of the New York State Commission in Lunacy. He was professor of psychiatry in Columbia University 1903–14. He has for several years been associate editor of the New York *Medical Journal* and the *Journal of Nervous and Mental Disease*. His publications include 'Poems and Swedish Translations' (1883); 'In the Shade of Ygdrasil' (1893); 'Nervous and Mental Diseases' (1901–11); 'American Textbook of Legal Medicine and Toxicology' (1903); 'A Song of the Latter Day' (1904).

PETERSSEN, (Hjalmar) Eilif, Norwegian painter: b. Christiania, 1852. He was educated at Carlsruhe and under Lindenschmit at Munich. His early efforts were confined to historical episodes of which his 'Christian II, signing a Death Warrant' (1876) is a good example. It is now in the Museum of Breslau. He next turned to religious subjects, of which 'The Ascension,' at Ulleven, is perhaps his greatest work. His next field was landscape and genre painting in which he was also successful. His best works in this style are 'Piazza Montanara' (1882); 'The Laundresses' (1889); 'Woodland Lake' (1891); 'Summer Night,' in the Munich Pinakothek and 'Gajamars Song' (1907).

PETERWARDEIN, pā'tĕr-vär-dīn, Hungary, a town in Croatia-Slavonia, on the right bank of the Danube, 45 miles by rail northwest of Belgrade. It is the site of the castle of Peter the Hermit (q.v.). It stands partly on a steep rock and partly on a marshy flat below and is the strongest fortress on the Danube. It communicates by a bridge of boats and a railway bridge with the town of Neusatz on the opposite bank. The fortifications are extensive and contain barracks for a garrison of 10,000 men; but the town itself is small. It has, however, four churches, a military hospital, an arsenal, a high school and a trade in wine and fruit. A great victory was gained here (5 Aug. 1716) over the Turks by Prince Eugene. Peterwardein was occupied by the Hungarians in the civil war of 1848–49. It was surrendered to the Austrians, 6 Sept. 1849. Pop. 6,000.

PETIGRU, pĕt'ĭ-groo, **James Louis**, American lawyer: b. Abbeville District, S. C., 10 March 1789; d. Charleston, S. C., 3 March 1863. He was graduated at the South Carolina College, now the University of South Carolina, in 1809 and in 1812 was admitted to the bar. Having attained professional eminence in the rural districts, he removed to Charleston, where he rapidly rose to distinction. In 1822 he became attorney-general of the State, which office he held for eight years. During the Nullification troubles of 1830–32 he opposed the doctrine of the State veto and was the most notable of the leaders of the "Union and State Rights" party. Upon the defeat of his party, he became in his political capacity an object of much popular dislike, but his talents and virtues nevertheless secured him the respect of the community in which he lived, and he continued to maintain his position as a leader at the bar with scarcely a rival. He subsequently served in the State legislature and despite general condemnation of his political opinions he was entrusted with the codification of the laws and statutes of South Carolina. Although stoutly opposed to the secession movement of 1860–61, he followed the fortunes of his State. Consult Grayson, W. J., 'James Louis Petigru' (New York 1866); and a memorial volume published by the Charleston bar in 1867.

PETIOLE, *in botany,* the stalk of a leaf. When the petiole is wanting, the leaf is said to be sessile. In general, however, it is distinctly marked and is usually either round, or half-cylindrical and channeled on the upper side. In the poplar it is strongly flattened at right angles to the blade and hence the remarkable movement observable on the least breath of wind, especially in the aspen. Sometimes, as in the garden sweet-pea, the petiole is furnished with a kind of border or wing. In many umbelliferous plants its base is dilated into a broad membranous inflated sheath. In grasses and various other plants it consists of a sheath embracing the stem; in the pea tribe the apex of the petiole is often changed into a tendril. In one section of the genus *Astragalus* (tragacanth) it hardens into a spine after the leaflet drops. The petiole in some Australian species of acacia and eucalyptus is flattened into a leak-like expansion, occupying the place of the true leaf; such petioles have received the name *phyllodia.* See LEAVES.

PÉTION, pā-tē-ōṅ, **Alexandre Sabes,** Haitian soldier and politician: b. Port-au-Prince, Haiti, 2 April 1770; d. there, 29 March 1818. He was educated in the military school of Paris, entered the French army in Haiti and in 1791 joined the forces of Toussaint l'Ouverture (q.v.), serving as commander of artillery. In 1799 he entered the service of General Riguad and upon the latter's defeat by l'Ouverture was obliged to leave the island. He went to France and returned in 1802 with the rank of colonel under General Leclerc, who was to subdue the island but in the same year Pétion joined the revolt under Henry Christophe and later served under Dessalines. The latter was murdered in 1806 and Christophe assumed the Presidency in 1807. The south and west provinces, however, declared for Pétion and chose him president of that portion of the island, which resulted in almost continual warfare. Pétion's administration was in marked contrast to that of Christophe. He opened his ports, granted protection to commerce, paid the debts of the country and introduced measures which gave great commercial and agricultural prosperity to the country. In 1815 he was elected President for life with power to nominate his successor, but in the latter part of his administration the financial affairs of the government became depressed, and Pétion fell a victim to hypochondria in which state he starved himself to death. Consult Saint John, Sir S. B., 'Hayti; or, the Black Republic' (London 1889).

PÉTION DE VILLENEUVE, dė vēl-nėv, **Jerôme,** French revolutionist: b. Chartres, France, 1753; d. near Saint Emilion, France, 1794. He was an advocate in his native city when chosen a deputy to the States-General in 1789, and in 1790 was president of the National Assembly. He later became a member of the Jacobin Club and a supporter of Robespierre. He was elected mayor of Paris in 1791, and president of the Convention in 1792 and voted for the execution of the king. Although he had exhibited unnecessary cruelty in forcing the return of the royal family from Varennes, he was nevertheless suspected of being a royalist, and the jealousy of Robespierre being aroused he was arrested with the Girondists in 1793. He escaped, but perished in a field near Saint Emilion, either by suicide or starvation. His works were published in four volumes in 1793. Consult Dauban, C. A., 'Mémoires inédites' (Paris 1866).

PETIT, pė-tē, **Louis,** French clergyman and author: b. Viuz-la-Chiésaz, Haute-Savoie, France, 21 Feb. 1868. He was educated at Notre Dame des Châteaux, Pas-de-Calais, France, the Assumption Scholasticate, Osma, Spain, and at Rome. He entered the order of the Augustinians of the Assumption in 1880 and was ordained in 1891. He was professor at Notre Dame des Châteaux, and at the Oriental Seminary, Phanaraki, Constantinople, in 1893–94. Thereafter he was superior of the houses of his order at Toulouse in 1894–95, at Kadi-Keui, Constantinople, in 1895–1908, and superior of Assumptionist missionaries in the Orient 1903 and from 1906 to 1912 was member of the general chapter of his order. From 1908 to 1911 he was engaged in research work in the Propaganda and Vatican Archives, Rome. In 1912 Dr. Petit was made archbishop of Athens and apostolic delegate to Greece He originated the plan of recasting and publishing in separate monographs Le Quien's 'Oriens Christianas'; made two trips of scientific exploration to Mount Athos in 1901 and 1905 and in 1911 was theologian and consultor of the Council of Armenian Catholics, Rome. His published works include 'Les confréries musulmanes' (1899); 'Typicon de Grégoire Pacouranos pour le monastère de Bachkovo (1904); 'Serborum per Hungarian constitutorum ordinationes ecclesiasticæ' (1906); 'Acta dissidii ecclesiastici græco-bulgarici' (1911); 'Recueil des inscriptions chrétiennes de l'Athos' (1904). With Martin he edited and contributed to Mansi, 'Amplissima collectio conciliorum'; and is a frequent contributor to religious reviews and periodicals.

PETIT DE JULLEVILLE, dė zhül-vēl, **Louis,** French historian of literature: b. Paris, 18 July 1841; d. Paris, 1900. He was graduated from the École Normale in 1863, receiving their degree of doctor of letters in 1868, and after teaching in the Collège Stanislas of Paris and the faculty of letters at Dijon, became professor of French literature in the Paris faculty of letters in 1886. His principal work is 'History of the Theatre in France' (1880–86); very complete with regard to the old French theatre. He gives in 'The Theatre in France' (1889) an account of the evolution of the French drama down to the present time. In 1896 he commenced the publication of a 'History of the French Language and Literature,' but died before its completion.

PETITION, Right of, *in public law,* the right of the citizen to present a formal supplication to the government for the granting of some favor, usually the redress of a grievance, in which the established courts were not authorized to act. The better opinion is that it also includes the right of the petitioner to have his petition heard, otherwise the right of petition is worthless. Like many of the great constitutional safeguards it is the result of a long struggle against tyranny. It was implied in the guarantees of Magna Charta and was so frequently exercised in the time of Edward II that it became necessary to formulate rules by which the task of hearing petitions could be facilitated. During this period petitions were usually made to the king, but later when Parliament had succeeded in establishing its supremacy over the royal power petitions came to be preferred to that body instead. The Stuarts looked with disfavor upon the growing practice of presenting petitions, and during the reign of Charles II Parliament passed an act forbidding the presentation of petitions signed by more than 10 persons and placing other restrictions upon the right of petition. The refusal of James II to hear the petition of the seven bishops, who refused to publish his declaration of independence, created a great sensation throughout England, and in the Declaration of Right drawn up by Parliament after the Revolution of 1688 it was declared to be the right of English subjects to petition the king and all commitments and prosecutions for such petitioning were declared to be illegal. This right was confirmed by the Act of Settlement of 1700. Petitions to Parliament now became very numerous and the exercise of the right may be said to have culminated in the Chartist movement of 1848, when a petition bearing its signatures of more than 1,000,000 persons was presented to Parliament praying for annual parliaments, universal suffrage and other reforms. In early times it became the custom of Parliament at the opening session to appoint «receivers» and «triers» of petitions, who examined them and referred them to the courts or to Parliament for consideration. In order to receive attention from Parliament petitions must be in a prescribed form, respectful in language and, with a few specified exceptions, must be presented by a member. The member, however, is not compelled by law to present it to the Parliament, and this omission has occasionally been the cause of complaint.

The first amendment of the Constitution of the United States prohibits Congress from making any law to abridge «the right of the people to peacefully assemble and to petition the government for a redress of grievances.» It will be seen from the language of this provision that its purpose is not to create the right of petition, its existence being assumed, but to secure it. In spite of this provision the National House of Representatives in the course of the controversy over slavery encroached seriously upon this right. Beginning as early as 1790 petitions for the abolition of the slave trade and the prohibition of slavery in the District of Columbia were presented to Congress. The latter were referred to the Committee on the District of Columbia and reported unfavorably. As the petitions increased the committee ceased to make reports. In 1836 the House adopted a rule providing that all petitions relating to slavery should be laid on the table without action and without being printed or referred to a committee. This was the first of the so-called «gag» rules and was stoutly opposed by John Quincy Adams, who had presented most of the petitions relating to slavery. Finally in January 1840 the House adopted a rule declaring that no petition praying for the abolition of slavery or of the interstate slave trade should be received or entertained in any manner whatever. For the repeal of this illiberal rule Adams labored incessantly until his efforts were crowned with success in 1844. After this the right of petition was never again abridged by Congress.

By the present rule petitions are delivered to the clerk, endorsed with the name of the member presenting them and of the committee to which they are referred, and by him they are transferred to the appropriate committee. All of the States with one or two exceptions have constitutional provisions guaranteeing the right of petition.

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PETITION OF RIGHT, in English politics, a celebrated statute of Parliament passed in 1628 declaratory of certain of the ancient rights and privileges of Englishmen. It had its origin in the controversy between Charles I and the Parliament concerning the prerogatives of the king and the privileges of the Commons. Charles had violated the privileges of Commons and the rights of the people by evasions of the Constitution. Accordingly it was resolved to demand from him a formal concession of those rights and privileges, in particular, which he had violated and to refuse a grant of supplies until his consent had been given. These rights were embodied in a statute, but the document is popularly known as the Petition of Right from the fact that the grievances of the Commons were presented in the form of a petition. When the petition was presented to the king for his approval he quibbled and hesitated and finally answered in a general way «that right should be done according to the laws and customs of the realm and that the statutes should be executed that his subjects may have no cause to complain of any wrong or opposition to their rights and liberties.» But the Commons refused to be satisfied with an answer so vague and indeterminate and prepared a remonstrance. Finally the king yielded and gave his assent in a manner acceptable to the Commons on 7 June 1628. The petition, after reciting various statutes recognizing the rights contended for, declared that taxes, forced loans, benevolences, gifts, etc., should no longer be demanded by the king without the consent of Parliament; that soldiers should not be billeted upon the citizens without payment; that no freeman should be imprisoned except by the law of the land; and that martial law should not be proclaimed in time of peace.

The Petition of Right Act of 1860 assures the petitioner the privilege of proceeding against the Crown at common law, or he may file his petition with the Secretary of State, upon which the king's fiat that right be done may be issued on the merits of the petition, the Crown thus accepting the defense. This privilege was extended to Ireland in 1873, but has never been bestowed upon Scotland.

PETÖFI, or PETON, pĕ'tĕ-fĭ, **Sandor (Alexander),** Hungarian poet: b. Kis-Körös, comitat of Pesth, 1823; d. near Schässburg, 31 July 1849. He was a common soldier for some two years and for a time a subordinate member of a troop of strolling players. His first published collection of verse (1844) established his national fame as a poet. He was less fortunate as a novelist. In March 1848 he came forward as a patriotic leader of the youth of Pesth with the celebrated 12 national requisitions and made the revolutionary cause triumphant for the time. His spirited lyric 'Talpra, Magyar' ('Up, Magyar') was everywhere sung, and was the first of a series of patriotic verses. In 1848 he joined the Honved, and served with distinction under Bem. He is believed to have perished in the battle of Schässburg, though his body was never found, and doubts were long entertained as to his being really dead. He banished false rhetoric from Hungarian poetry, and much of his own work attained a true folk-character. He was a very prolific writer, and in the six years 1844–49 he published 10 volumes of poems, besides producing a countless number of minor writings. There are renderings into English by Sir John Bowring (London (1866); Loew, W. H., 'Gems from Petöfi and other Hungarian Poets' (New York 1881), and Phillips, Henry J. (Philadelphia 1885). There are also numerous translations in German and other languages. The best critical edition of his work is that by Haras (1894). Consult biographies in Magyar by Zilahy (1864) and Vutkovics (1883); Bubeník, 'A Petöfi, eine Skizze seines Lebens und Dichtens' (1882); Fischer, 'Petöfis Leben und Werke' (1889); Ferenczi, Z., 'Petöfi: Poète de la Liberte' (Budapest 1912).

PETOSKEY, pę-tŏs'ki, Mich., city, county-seat of Emmet County, at the mouth of Bear River, on the south shore of Little Traverse Bay, an inlet of Lake Michigan, and on the Pere Marquette and the Grand Rapids and Indiana railroads, about 191 miles north of Grand Rapids and 35 miles south of Mackinac. It has steamer connections with the lake ports. It was settled in 1874 by white traders and missionaries; incorporated in 1879 and chartered as a city in 1895. It is in a lumber region, but the surrounding cleared land has been converted into productive farms. The chief manufacturing establishments are lumber works; leather works, which employ about 150 persons; fibre and paper mills, 125 persons; woodenware works, 75; lime works, 110; other industries about 200 more. The delightful summer climate attracts thousands of visitors which necessitates extensive hotel accommodations and the employment of many persons during the season. It has the Lockwood Hospital, 11 churches, public and parish schools and a public library. The two banks have a combined capital of $160,000, and the annual amount of business is over $1,000,000. The county offices are housed in the new $30,000 city hall. The government is vested in a mayor and a board of public works, a council of eight members, who hold office two years. The population is composed of a majority American born, a number of Germans, a few Armenians, Indians, Hungarians and Poles. Pop. 5,500.

PETRA, pē'trą, in Aramaic, called Rekem, and in Hebrew Sela, a ruined Nabatæan city of the land of Edom, northern Arabia, in the eastern part of Arabia Petræa, to which it gave that name. Its great importance was as a trading place and station on the caravan route between Syria and Arabia up to the 4th century A.D. A century later it had disappeared from the annals of human history and even its site was unknown until 1812 when Burckhardt discovered it in the Wadi Musa. The ruined city lies in a narrow valley which is surrounded on all sides by lofty mountains, embracing an area about one mile in length and half a mile in width. One of the striking characteristics of the place is the carving upon the perpendicular faces of the cliffs of ornate fronts of temples and tombs. The interiors of these excavated rooms, however, are scarcely more than caves, bare of any attempt at ornament or even finish. A great "treasure house," an amphitheatre, convent, citadel and palace have been found, mostly of late Greek architecture, but with evidence of Egyptian and Oriental influences, also in the older remains. The city was captured by Amaziah of Judah in the 9th century B.C.; became the property of the Nabatæans in the 3d (or 2d) century B.C., was made tributary to Rome in the 1st century B.C., and in the 2d century A.D. became capital of a Roman province, Arabia Petræa. It was a Christian bishopric during its last years. Consult Buhl, H., 'Geschichte der Edomiter' (Heidelberg 1893); Burckhardt, J. L., 'Travels in Syria and the Holy Land' (London 1822); Dalman, G. H., 'Petra und seine Felsheiligtümer (Leipzig 1905); Duc de Luynes, 'Voyage d'Exploration a la Mer Morte, a Petrée' (Paris 1875); Hornby, E., 'Sinai and Petra' (London 1901); Palmer, E. H., 'The Desert of the Exodus' (Cambridge 1871).

PETRARCH, pē'trärk (Italian, PETRARCA, pä-trär'kä), **Francesco**, Italian lyric poet and scholar: b. Arezzo, 20 July 1304; d. Arqua, near Padua, 18 July 1374. Soon after his birth the family moved to Avignon, France, and here the lad received his early education, going later to institutions at Montpellier (1319–23), and thence to Bologna, where he studied law during the period 1323–25. Though he pursued his profession with success, his own inclinations led him to devote much time to the Latin and Provençal poets. He returned to Avignon, where he came into a small inheritance which gave him freedom to pursue his favorite studies. His talent for Latin poetry commended him to the court of Pope John XXII, and he took minor orders in the Church. It was at this time that he first saw in the church of Saint Claire (1327) the Laura who exercised so great an influence on his future life, and was his inspiration in his most famous works. The identity of this personage, and whether she was a real or ideal one, has been much disputed, but she is generally believed to have been the 19-year old wife of Hugues de Sade, and the story is that she was so embarrassed by the passion of Petrarch that she rebuked him in public. Pope Benedict XII conferred on Petrarch a cannonry at Lombez (1335). In 1336 he embarked at Marseilles for Rome, the antiquities of which he visited with an enthusiasm which he has recorded in his poems. In 1337 he returned to Avignon and bought a small estate at Vaucluse. He remained here for three years and wrote numerous sonnets which acquired popularity even before the earlier and longer work of Dante (still in manuscript), and served to fix the Italian language. These were, however, only his recreation. He rested his hopes of fame on his Latin scholarship. Virgil, Cicero and Livy were his favorite authors, but he was a diligent explorer of the monasteries for old manuscripts of all the Latin classics (he did not learn Greek till comparatively late in life), which he transcribed with his own hand, and diffused as much as possible, while he formed a precious collection of his own. In his search he traveled widely through France, Germany, Italy and Spain, making many discoveries, which have placed his name high among the restorers of letters, and preserving through his copies invaluable manuscripts which otherwise would have been lost to the world of letters. He had advanced views for his age of history and science, despising legends and astrology, and recommending true research. In politics his views were equally advanced. In religious matters he had no sympathy with the skepticism common among the scholars of his day. His Latin works, both in prose and verse, were highly esteemed, and in 1341 he was called to Rome to receive on Easter-day (8 April), the crown of laureate of the civilized world, awarded him for his Latin epic, 'Africa,' a work of real eloquence. He was subsequently charged with various diplomatic missions, and in 1342 appointed joint ambassador with Rienzi to Clement VI to solicit his return to Rome. He praised the enterprise of Rienzi (1347) in a Latin epistle, and went to Rome, though too late, to support him. At one time he thought of shutting himself up in a monastery, and determined to live more in accordance with his ecclesiastical profession. In 1353 he returned to Italy, where his repute led to his employment in many important diplomatic negotiations. He was consulted by the Pope and the emperor. In 1354 he negotiated a peace between the republics of Genoa and Venice in the name of Giovanni Visconti of Milan. From this time, with the exception of embassies to France and Germany, he lived entirely in Italy, and until 1366 chiefly at Milan, Padua and Venice, to the last of which he presented his library. In 1370 he took up his residence at Arqua, near Padua, where he passed his remaining years in religious exercises. He had two natural children by an Avignon lady — a son who died before his father, and a daughter who married Francesco de Brossano, a Milanese gentleman, who became his executor. Petrarca left no works in Italian prose. Among his Latin works are three books of 'Epistles' ('Epistolæ Familiares') and 12 'Eclogues,' his epic poem 'Africa,' various philosophical, religious, political and historical treatises, as 'De Officio et Virtutibus Imperatoris'; 'De Remediis utriusque Fortunæ'; 'De Vita Solitaria'; 'De Vera Sapientia'; 'De Contemptu Mundi'; 'Itinerarium Syriacum' (a geographical work), and 'Epitome Vitarum Viror Illustrium.' His Italian poems consist of 'Sonetti' and 'Canzoni in Vita e in Morte di Laura,' and of 'Trionfi.' The first edition is dated Venice, 1470. The subsequent editions are innumerable. They may be found translated into English by various hands. The 'Trionfi' are in *terza rima.* Despite their refinement and delicacy of sentiment and purity of language, the sonnets of Petrarch are somewhat dull and monotonous. They are also filled, according to the taste of the age, with conceits, artificial refinements of sentiment and plays upon words. Petrarch's learning was very great, and, for his time, critical. He despised the vulgar tongue of Italy, but as the champion of national unity wrote in that tongue such celebrated patriotic poems as the canzone 'Spirito Gentil.' As a writer of Latin he ranks among the best of modern times and shares with Boccaccio the credit of having restored classical scholarship. He is placed by suffrage of the Italians as among their poets second to Dante only. (See PETRARCH'S SONNETS). Consult Lord Woodhouselee, 'An Historical and Critical Essay on the Life of Petrarch' (1810); Campbell, T., 'Life and Times of Petrarch' (London 1843); Cayley, C. B., 'The Sonnets and Stanzas of Petrarch' (London 1879); Koerting, G. C. O., 'Petrarca's Leben und Werke' (Leipzig 1878); Longfellow, H. W., 'Poets and Poetry of Europe' (New York 1855); Mézières, A. J. F., 'Petrarque' (Paris 1896); Robinson and Rolfe, 'Petrarch, the First Modern Scholar' (New York 1898).

PETRARCH'S SONNETS. The Sonnets of Petrarch, written and often revised during the years between 1327 and 1374, cannot be properly understood without reference to Petrarch the scholar, whose earnest study of classic authors then known by little more than their names gave him philosophic breadth and humanistic sympathy far in advance of the narrow and dogmatic teaching of mediæval scholastics and dowered him with a delicacy of diction and a wealth of mythological imagery that gained him the delighted appreciation of his own generation and helped establish him as a master for several generations of romantic lyrists. Nor can we enter fully into the spirit of these centuries-old love poems without a sympathetic knowledge of the man himself, a scholar of genuine and, for his generation, surprising intellectual attainment, yet a singularly winning, affectionate human being, with a lively interest in all that concerned those near him, and an admirable capacity for loyal and enduring friendship. The constancy to a relation so entirely one-sided as Petrarch's passion for Laura, the lady of his verse, seems not uncharacteristic of the man who said, «After you have once decided upon a friend, there must be no doubt concerning the friendship. . . . There must be no mistrust, no fear.»

The term «Sonnets,» in the case of Petrarch, has been loosely applied to that verse which is the expression of the poet's love passion. As a matter of fact, Petrarch employed as his instrument not only about 300 sonnets, but a number of poems in looser verse form, variously styled, and six long poems entitled the 'Trionfi' or 'Triumphs,' celebrating the successive victories over each other of love, chastity, death, fame, time and eternity. To the entire collection he himself gave the name, 'Canzoniere' or 'Song Book.' As everyone knows, this volume of verse is, with the exception of a few occasional poems, inspired by the lady whom Petrarch names Laura. Whether Laura, under either this or another name, really existed is a matter of dispute among scholars. Beyond suspicion of forgery are the records made by Petrarch of his meeting with her, and of her death 21 years later. Yet no indisputable evidence confirming her identity exists, and Petrarch's constant play on the name Laura, likening it to Laus (renown) and Laurel, the meed of the successful poet, gave rise, even among his own contemporaries, to the accusation that the lady of his aspiration was merely the personification of the poet's literary ambitions. However, it would seem impossible for anyone reading the Sonnets with sympathetic attention to give such an impersonal interpretation to them. They certainly lack definite information concerning Laura. Other than that she is lovely to look upon, with golden hair, and lashes and eyebrows of jet, that her bearing is modest and dignified, and that she is endowed with a spiritual grace that is at once the inspiration and despair of the poet, she is without attribute. But that this is so by no means disproves the actuality of her existence, and it most assuredly does not disprove the reality and poignancy of the emotion aroused through her in the soul of Petrarch. The quality of this emotion and the mood and philosophy to which it gave rise can be more clearly understood after an examination of the poems themselves to discover the poet's method and the scope of his artistic range.

Exclusive of those which deal with other matters, the Sonnets begin with chronicling his first encounter with Laura at the age of 23, and his helplessness, as a naked youth, against love's dart, which found entrance through his eyes and transfixed his heart. From that moment, he is love's captive, borne on, as by a steed heedless to bridle or spur, to that laurel whose flower aggravates the pain that it should heal. This comparison of Laura to the laurel is one of many figures employed. Now she is a sun, shedding the light of her eyes on him to waken him into new life; she is a flame and he the fated moth; she is the enchantress who transforms Petrarch himself into a laurel whose constant green defies the changing wintry blasts. She is dire winter, on her eyes hang the cloud, in her heart is unyielding ice. Again, such fire burns in her eyes that he melts as snow and would fain assuage his pain by death. Sometimes she is not Love but Love's opponent. Because his “two loved lights (Laura's eyes) their wonted aid restrain,” Love rides the poet's ship, desire mans every oar, and, while “Reason and Art lie dead amid the storm,” he himself is borne by the wet wind of his own sighs and tears through the fog of disdain to destruction. The figure of his lady's eyes acting as beacons of safety and a guide to higher things is often employed, and with the passage of years and the deepening of the poet's passion takes its place as a symbol of that spiritualizing influence exerted by her to which he so often and especially after her death pays tribute. In her presence lust died, in her regard was a heavenly grace worn only by the blest in realms on high.

The above, translated almost literally from passages throughout the poems, indicates how entirely subjective is their content. They celebrate not the lady but the moods, the thought, the reflections aroused in the poet by the sight and memory of her. Her presence causes him unspeakable joy, while at the same time it creates unendurable desires. She unfits him for serious work, even as she inspires him to nobler ends. The lover and poet would rejoice in this manifestation of human loveliness did not thwarted passion demand toll, while monastic tradition frowned in angry reproof. Entirely sincere are Petrarch's pleas that heavenly aid deliver him from the “mortal loveliness” that “seized and soiled” his soul. Yet quite as sincere is the expression of his grief and loneliness after the death of Laura, his longing for her presence, and the comfort that dreams and visions of her bring.

This dualism or antagonism of thought and utterance became the keynote of the horde of Petrarchan imitators that followed in Italy, France, England and Spain. With them it was almost entirely a matter of form, the contrasting moods of the poet or lover being simply material out of which to fashion what are known as “conceits,” highly elaborated and in crude hands highly absurd figures of speech. With Petrarch, however, sophisticated as he is, and in style polished almost to the point of preciosity, there is a profound basis of feeling and an irreconcilable spiritual paradox. It is not enough to recall that, whatever the impediment, Petrarch's love was not returned. Mere possession of the loved one might have brought passing joy to Petrarch the man. But there would still remain unsatisfied Petrarch the idealist, the mortal conscious of his dross, of his eternal inability to remain at one with the divine. From this arose the restlessness, the self-conflict, the recurrent stand against that love which now inflamed him with holy zeal, now fanned desire and the pursuit of self-gratification. A disciple of Augustine, he could not but believe such imaginings and affections were unholy things, even as his intellect, founded on the calm philosophy of the Stoics, resented the beauty that “spoiled his mind of judgment and from freedom's lofty path so drew him.” Yet the very nobility of the object of his desire was to him both as idealist and lover sufficient justification for its continued pursuit.

The type of imagery employed by Petrarch has been indicated. To this factor in artistic effect may be added his many charming descriptions of nature. In this there is nothing of marked originality or intimacy. Fresh-leaved woods, fountains, sweet air, are usually but a background, sympathetic or the reverse, to the mood of the poet. The attitude of the writer is again subjective, his range of observation distinctly limited. But read in the light of Petrarch's many-times avowed preference for the peace and beauty of the country, and his actual choice of it as a residence, these expressions of appreciation are added confirmation of the sincerity of his feeling and its utterance.

A complete critical edition of Petrarch's verse was made in 1896 by Giovanni Mestica. His lyrics were edited by Carducci and Ferrari in 1899, and by Salvo-Cozzo in 1904. The ‹Trionfi› were edited in 1901 by Carl Appel. A number of English poets have translated individual poems. These translations have been collected into a convenient volume issued by George Bell and Sons of London in their Bohn library.

Clara deLissa Berg.

PETREL, any of the smaller species of a group of oceanic birds allied to the albatrosses, characterized by webbed feet and tubular nostrils. In the albatrosses the tubular nostrils of the two sides are quite distinct, while the fulmars, shearwaters and petrels proper have them united to each other and to the base of the bill, and are, therefore, placed in a distinct family the *Procellariidæ*. Most of them also have the hallux much better developed than have the albatrosses. The wings are long and pointed, the tail short but of various shapes, and usually with 14 or 16 quill-feathers. Owing to its compactness and oiliness the plumage is extremely resistant to water. The feet are small and completely webbed in front. The fulmars and shearwaters are relatively large birds, the petrels proper of small size and distinguished by the prominence of the nasal tube and the more or less hooked beak. Except during the breeding season the petrels never voluntarily come on land, and seldom even approach the shores, but remain out at sea even during the most severe storms. Sailors call the smaller ones, indiscriminately as to species, Mother Carey's chickens. Probably 75 species are known, many of which have a wide range. They feed on small marine animals and on almost any kind of food-refuse cast overboard from ships, and appear exceedingly fond of fat or grease, for which, and for other edibles, they will follow in the wake of vessels for great distances, and for many days continuously, and often collect in great numbers where food is plentiful. When irritated they vomit an oily fluid of highly offensive odor.

These birds breed in large communities in localities adjoining the sea, forming their nests in holes, usually in the face of a cliff, but often in burrows or cavities which they dig for themselves or appropriate from rabbits and other burrowing animals. Where the earth is hard and digging difficult several females will lay in the same burrow. The female lays one egg. They are not often seen near shore in the daytime, remaining hidden in the nest and going abroad for food at night. They fly rapidly, and generally close to the water; and when in pursuit of food they suspend themselves by extending their wings, and appear to run on the surface of the water. It is from this circumstance that they are called petrels («little Peters»), after the apostle Peter, who walked on the water. The appearance of these birds is considered by seamen to presage a storm — hence the common name of a familiar species (*P. pelagica*) known as the «stormy petrel»— and it is thought peculiarly unlucky to kill one of them. The largest representative of the group is the Giant Fulmar of the southern seas. This bird has a wing spread of six to seven feet. In northern waters the largest is the fulmar petrel, a bird about 20 inches in length. Owing to their wandering habits most of the species are likely to be seen occasionally in North American waters, where fully 15 species of true petrels, besides as many more shearwaters and fulmars, have been actually recorded. The best-known on the North Atlantic Coast is Leach's petrel (*Cymochorea leucorrhoa*), a pretty little bird in black with a white rump, which skims the waves with the most marvelous skill and seems never to tire. It is barely six inches long and one of the smallest of water birds. Wilson's stormy petrel (*Oceanites oceanicus*) is one of several petrels characterized by their long plover-like legs. It is one of the most widely dispersed and commonest species on the high seas. The diving petrels are a distinct group, belonging to the family *Pelecanoididæ*. These birds are eight to nine inches in length, and they are numerous in the waters about Australia and New Zealand. They have become famous from their habit of diving at full speed through the crests of waves. Consult Baird, Brewer and Ridgway, ‘North American Water Birds’ (Boston 1884); Knowlton, F. H., ‘Birds of the World’ (New York 1909); Salvin, ‘Challenger Reports’ (Vols. II and IV, London 1881–82).

PETRIE, pē'trę, **William Matthew Flinders,** English Egyptologist, grandson of Matthew Flinders (q.v.), the Australian explorer: b. Charlton, 3 June 1853. He received a private education, and in 1875–80 devoted his attention to British archæology, the results appearing in the works, ‘Inductive Metrology, or the Recovery of Ancient Measures from the Monuments’ (1877), and ‘Stonehenge: Plans, Description, and Theories’ (1880). He then went to Egypt, making a careful survey of the pyramids of Gizeh, of which he published an account in ‘The Pyramids and Temples of Gizeh’ (1883). He continued his work in Egypt under the auspices of the Egypt Exploration Fund Committee (1884–86); excavated the site of Tanis, and discovered and excavated Naukratis, Am and Daphnæ, his results being published in ‘Tanis’ (1885–87), ‘Naukratis’ (1886). In 1894 he founded the Egyptian Research Account and was instrumental in enlarging the British School of Archæology in Egypt in 1905. He has continued his explorations of ancient sites, his excavations forming the theme of the works ‘Hawara’ (1889); ‘Tell el Amarna’ (1895); ‘Koptos’ (1896); ‘Denderah’ (1900); ‘Diospolis’ (1901), and ‘Royal Tombs of the Earliest Dynasties’ (1901), etc. Among other publications are ‘A Season in Egypt’ (1888); ‘Racial Portraits’ (1888); ‘Historical Scarabs’ (1889); ‘Ten Years' Digging in Egypt’ (1893); ‘A History of Egypt’ (2 vols., 1895–97); ‘Egyptian Tales’ (2 vols., 1895–99); ‘Egyptian Decorative Art’ (1895); ‘Religion and Conscience in Ancient Egypt’ (1898); ‘Syria and Egypt’ (1898); ‘Diospolis’ (1901); ‘Abydos’ (1902–03); ‘Ehnasya’ (1904); ‘Researches in Sinai’ (1906); ‘Hyksos and Israelite Cities’ (1906); ‘Gizeh and Rifeh’ (1907); ‘Athribis’ (1908); ‘Personal Religion in Egypt’ (1908); ‘Memphis’ (1909); ‘Qurneh’ (1909); ‘Arts and Crafts in Egypt’ (1909); ‘Egypt and Israel’ (1911); ‘Tarkhan’ (1912–13); ‘Amulets’ (1914); ‘Heliopolis’ (1914); ‘Scarabs’ (1917); ‘Tools and Weapons’ (1917). Since 1892 he has been professor of Egyptology in University College, London.

PETRIFACTION, literally to make into a stone, specifically the replacement of organic substance by mineral matter in such a way that the minute details of structure are preserved. The petrifaction of wood with the preservation of the grain is a familiar example. The common statement that petrifaction and fossilization are the same is not strictly true, since some fossils are merely the imprint of the organism, such as the tracery of fern leaves in coal beds. Silica and calcium carbonate are the most common substances to replace organisms. See FOSSILS.

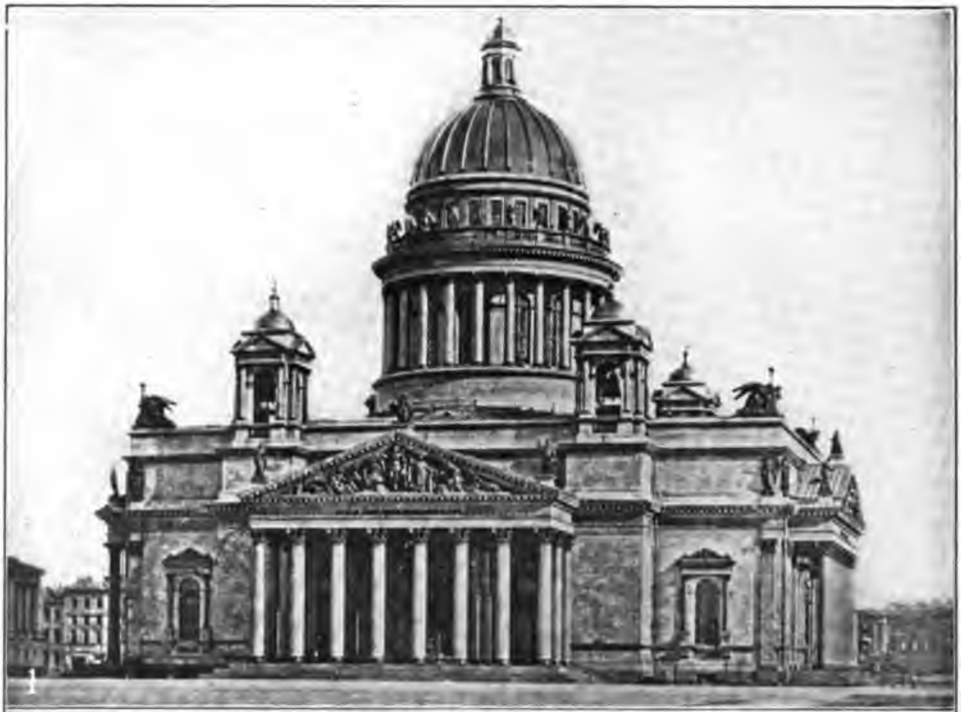
PETRIFIED FORESTS. See FORESTS, PETRIFIED.

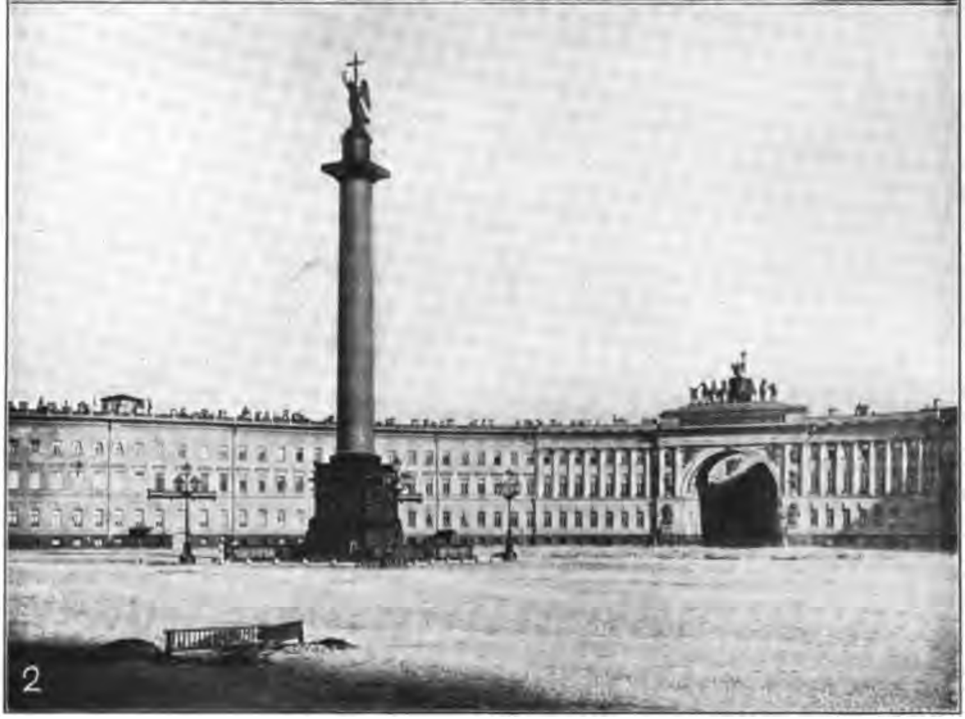
PETROBRUSIANS, followers of Pierre de Bruys, who in Languedoc, during the 12th century, founded a sect of religious extremists. His tenets included the rejection of infant baptism, the abolition of church music, the destruction of church buildings, the disuse of the cross as an object of veneration and a denial of the Real Presence in the Eucharist, whose elements were, he said, mere symbols; and strenuously opposed all prayers and services offered in behalf of the dead. For 20 years his doctrines were propagated with fiery zeal, and the number of his followers in southern France rapidly increased. Peter, abbot of Cluny, wrote a treatise to refute him, and he incurred the anger of the people by the demolition of altars and churches, and in 1124 was burnt to death by the mob at Saint Gilles, near Nimes. The Petrobrusians as a sect disappeared in the closing years of the 13th century.

PETRÓGRAD, a government of Russia, formerly (till 1 Sept. 1914) called Saint Petersburg. Situated in the northwest of Russia, Petrograd is bounded on the north by Finland and the gulf of that name; area, 17,226 square miles of land and 3,534 square miles of water surface; population in 1914, 3,136,500, of which number 2,133,100 were at that time located in the city of Petrograd. On the west lie the provinces of Esthonia and Livonia; south and southeast those of Pskov and Novgorod, respectively. Petrograd includes Lake Ladoga (the largest in Europe, nearly 7,000 square miles), Lake Peipus and the Neva and Narova rivers. The flat and generally marshy surface is nearly half covered with forests and almost a quarter with waste lands, unsuitable for tillage. Little effort has been made to render the ground available for cultivation; potatoes, flax, rye, barley and oats are grown, mainly for local consumption. The waters — including the gulf — supply an abundance of fish. Cotton weaving is an important industry, while the other industries and manufactures are the same as those carried on in the city of Petrograd. Much trade is transacted at the numerous fairs which are periodically held in almost every town and village. Its early history is almost parallel with that of the city, though the whole territory did not become Russian till 1721, or 19 years after Peter the Great had conquered the site on which the capital stands. Two communes belonging to the province of Viborg (Finland) were detached in 1911 and added to Petrograd, which was thus enlarged by about 600 square miles.

PETROGRAD, formerly Saint Petersburg, the capital of the former Russian Empire, in the government of Petrograd, situated on the delta of the Neva, at the head of the Gulf of Finland, in 59° 57′ N. lat. and 30° 20′ E. long., 400 miles northwest of Moscow, the ancient capital, and 1,400 miles from Odessa. The city covers an extensive area embracing the banks of the river bordering the mainland as well as numerous islands formed by the many branches of the Neva, about 30 feet above sea-level. The principal portion is on the right bank; the other parts are built on the islands, which are connected with each other and the mainland by numerous bridges. The Neva, which flows from Lake Ladoga near Schlüsselburg, empties itself into the Gulf of Finland after a course of 43 miles. It enters Petrograd near the convent of Saint Alexander-Nevsky, describing a great arc about 10 miles long and dividing into several branches — Great or Bolshaya Neva, Little or Malaya Neva and the Great and Little Nevka. The principal navigation is on the Great Neva, but there are numerous sand-banks where only vessels of low draught can pass. Inundations not infrequently occur; the strong southwest winds at times raise the Neva considerably and causes it to overflow its banks. On such occasions cannon-shots from the citadel warn the people of the coming flood. Between the Great Neva and the Little Neva lies Basil Island (Vassili Ostrov), a part of which (Golodai Ostrov) is again cut off by the narrow Smolenskaya River. The next largest island is what was formerly called the Peterburgsky Ostrov, on which the Alexander Park and Zoological Garden are situated, separated by a canal, Kronversky, from the fortress of Saint Peter and Saint Paul, which stands on an island connected with the mainland by the Troitsky Bridge. The other islands are Aptekarsky Ostrov (Apothecarie's Island), Kamenny Ostrov (Stone Island), Yelaghine Ostrov, Krestovsky Ostrov, Volny Ostrov, Petrovsky Ostrov, Gutuijevsky Ostrov, Krugly Ostrov and several smaller ones. Of the bridges only three are permanent; others are built on boats (pontoons) and removed periodically, especially when the ice descends from Lake Ladoga. Some 200 canals have been constructed to receive the overflow of the river and the melting ice and snow in the spring. The canals are spanned by granite and iron bridges, with a draw-bridge in the middle. Lying on low, marshy ground, the climate is extremely variable, cold and damp; rain and snow fall for over 150 days in the year. Spring commences late; snow often lies till May, and about the middle of that month the first green begins to appear. June, July and part of August there is agreeable weather. During September and the first half of October the temperature is fairly regular. Altogether, Petrograd enjoys barely three and a half months of pleasant weather. The average temperature in July is 64° F. and in January 15° F., when all the waterways are frozen over. The time in Petrograd is seven hours ahead of New York. The banks of the principal canals are protected by solid walls of granite, and the quays of the Neva are necessarily more substantial than those of any other European city. Great forests extend to the very confines of the city in one direction, while marshy bogs are characteristic everywhere. Petrograd comprises 12 districts or quarters (chásti), subdivided into 38 arrondissements or police precincts. The most important section of the city is that south of the Admiralty, from which the principal streets radiate. With few exceptions the streets are wide and commodious; the sidewalks are narrow and most of the roads are roughly paved. The streets are divided into three classes: «prospect,» equivalent to the New York «avenue»; úlitza, cross-street, and «pereúlok,» or third-class thoroughfare. Of the «prospécty» the most famous is the «Nevsky Próspect,» which shares with Princes street in Edinburgh (Scotland) the distinction of being the two finest streets in the world.

PETROGRAD, RUSSIA





1 The Cathedral of Saint Isaac

2 The Column Alexander and the Admiralty

Many travelers, indeed, award the palm to the Nevsky Próspect. Other prominent thoroughfares are the Voznessensky Próspect, Liteiny Próspect, the Vladimirsky Próspect, Gorokhóvaya Ulitza, Mórskaya, Millionnaya, Sadóvaya, Kazánskaya and Koniuchénnaya. These streets contain the palaces of the court and nobility and of the better classes. Owing to the swampy nature of the ground the main buildings are generally erected on wooden piles in large plots. This part of the residential district on the south bank of the Neva occupies the peninsula or the Bólshaya or Great Side; that on the north bank, including the islands, Petrograd (formerly Peterburgskaya). Across the Alexander Bridge lies the district of Viborg. The Peterburgskaya section contains the commercial and business district and also the important docks and warehouses, the stock exchange (birzha), scientific institutions and numerous schools and colleges. The old fortress of Saint Peter and Saint Paul on Peterburgsky Island faces the Winter Palace, and contains the Mint (Monety Dvor) and the ancient cathedral (sobór) where all the Russian sovereigns except the last one are buried with their families. Here are political prisons — generally crowded — behind which stands the arsenal, and in the wide streets are the houses where the minor government officials dwelt before the revolution cut off their functions. Many of the islands contain attractive parks and summer houses of the wealthy. The old Admiralty, founded by Peter the Great in 1705, stands in the midst of a spacious square enclosed by trees on three sides. Near it are grouped the principal buildings of the capital, which include the «Glavny Shtab» (headquarter staff), containing the Foreign Office and Customs Department; the War Department (Voyénnoye Ministérstvo) the cathedral, the Senate and the Synod, and nearby the equestrian statue of Peter the Great, erected by Catherine II. On the right is the huge Winter Palace, an immense quadrilateral block erected in the middle of the 18th century. It was rebuilt after having been destroyed by fire in 1837. It is the largest palace in the world and was a city in itself when formerly occupied by the imperial family, accommodating 6,000 people. Its fine halls are rich in statuary, paintings and gems of art, including the tables of rare malachite. The great court ceremonials were held in this palace, and in its treasury were preserved the costly crown jewels. The Hermitage, a classical edifice built by Catherine II, but reconstructed in 1840–50, contains one of the richest artistic and archæological collections in the world, including sculptures and masterpieces from all the famous schools of painters. In Petrovsky square stands the cathedral of Saint Isaac, built of granite and marble, whose five gilded domes are conspicuous from all parts of the city. It is of almost cubic form and void of any artistic beauty, though its peristyles of colossal red granite monoliths create a striking impression. Rich in interior decorations, its paintings represent Russian art for over a century. On a large square south of the cathedral stands a monument to Nicholas I, a rather stiff Doric column; there are other monuments to Catherine II, one commemorating the Russo-Turkish War 1877–78, etc. The arsenal contains a museum of artillery; the Academy of Sciences has an extensive museum and art collection and a library of 350,000 volumes. The «Imperial» Library is one of the most valuable in the world, containing considerably over 1,000,000 volumes and many priceless manuscripts, besides some 100,000 engravings. Catherine II purchased the library of Voltaire and added it to the collection. Besides other theatres, there are four in which plays and operas are rendered in different languages. Scattered all over the city are lofty watch-towers used for signaling danger by fire or water. The general style of architecture — apart from the purely Russian — is nondescript and lacks the picturesque element — masses of architecture in endless lines, often gorgeous, but frequently tasteless. There are about 400 churches; besides those mentioned are the cathedral of Our Lady of Kazan, celebrated for its Napoleonic trophies; the church of Saint Alexander Nevski, the church of the Smolnoi, convent and the church of the Preobrazhenskaya, rich in military trophies. The chief scientific and educational institutions, of which there is a vast number and variety, include the University, the Ladies' University, the Mining Institute, The Imperial Academy of Medicine, the Technological Institute of Nicholas I, Medical College for Women, Polytechnic College for Women, besides a great number of art, music, literary, mining, military and scientific institutions which make Petrograd one of the great intellectual centres of the world. Despite this, the percentage of illiteracy for European Russia is as high as 70. . About 150 newspapers were published in Petrograd before the revolution. The palaces not already referred to are the Marble, Taurida (where the Duma met), Annitchkov — a favorite residence of the late Tsar, and the new Michaelov Palace, one of the most elegant buildings in the city. The government buildings are remarkable for their enormous size. There are numerous hospitals, dispensaries, convalescent homes and charitable institutions. Among the more important of the manufactures are those of Gobelin tapestry, glass, porcelain, military surgical instruments, articles of malachite and precious stones, machinery, embroidery, etc. There are great ironworks, shipbuilding yards, breweries, distilleries, sugar refineries, textile mills, factories for the preparation of tobacco, silk, cotton, leather, paper mills, clock, watch and jewelry works, and various other industries. The commerce of the city is enormous; six railroads converge there; nearly half of the entire shipping trade of the country passes through the ports of Petrograd and Kronstadt, the latter 16 miles distant (connected by canal), where the large vessels unload. Increased railway facilities have developed internal traffic and trade to a remarkable extent. A great grain-producing country, Russia exports thousands of shiploads through Petrograd to northern Europe. The war and the subsequent revolution in 1917 have so disorganized the trade of Petrograd that all former statistics are now obsolete and meaningless.

Tsárskoe-Seló (Tsar Village), 22 versts (16 miles) south-southeast of Petrograd, is a summer resort of society. It contains two castles eight churches, several barracks, hospitals, etc., and has a population of 24,000. Peter the Great had a residence here, and since his time it has been the favorite summer residence of Russian sovereigns. The Old Palace (Stáry Dvorets) is an immense building in rococco style erected under Elizabeth and Catherine II, and internally decorated with extraordinary magnificence. The New Palace (Nóvy Dvorets) was built by Catherine for her grandson, Alexander I, and contains a valuable library and a military museum. A fine theatre in Chinese style stands in the Alexander Garden. Several German communities are scattered around the environs. Peterhof, also a former imperial residence, is situated on the southern coast of the gulf about 20 miles from the city and contains a magnificent palace begun by Peter the Great in imitation of the palace at Versailles.

The population of Petrograd in 1914 was 2,133,100, and in 1915, it was 2,318,645, of which number about 75 per cent was Russian; the remainder was made up of Poles, Finns, Germans, Jews and other nationalities. After London, Paris, Berlin and Vienna it is the fifth largest city in Europe. By far the bulk of the population — over 80 per cent — professed the Orthodox faith; less than 10 per cent was Protestant, and about 4 per cent Roman Catholic. In 1800 the population was 220,000; in 1864 it was 539,120; it rose to 1,870,000 in 1908 and in 1912, at the last census, it was 2,018,596.

History.— The territory between the Gulf of Finland and Lake Ladoga was inhabited by Finns and Slavs during the 9th century. Swedes settled at the mouth of the Neva in 1300, and during the next four centuries the land changed hands several times, but remained most of the period in possession of the Swedes, from whom it was reconquered by Peter the Great in 1702. He laid the foundation of the city in May 1703; the first brick house was built in 1710, and in 1712 the seat of empire was transferred hither from Moscow, by which move Peter transformed Russia (Muscovy) from an Oriental into an Occidental power. He forced Western civilization upon his subjects by relentless methods, compelled them to help in the building and development of the capital by residing there, and obliged every vessel arriving to carry stones in her cargo to build the walls and pave the streets. All the stone had to be transported to the site, which was at the time a desolate, unhealthy Finnish marsh. A great fire in 1736 destroyed 2,000 houses; another in 1780 destroyed over 11,000 houses, and in 1796 a conflagration devoured government magazines, naval stores and many vessels. The last great fire was in 1862. The railroad to Moscow was completed in 1851; to Berlin in 1862. Apart from local disturbances, such as revolutionary riots, Petrograd has no stirring history like the other and older European capitals. In 1901 and 1902 revolutionary demonstrations were rigorously suppressed, and the Putiloff ironworks strike in January 1905 led to the events of «Bloody Sunday» (22 January), when thousands of workmen approached the Winter Palace headed by the notorious Father Gapon to petition the Tsar for redress of their grievances. The troops fired on the crowd and hundreds were killed. On 1 Sept. 1914 the old name of Saint Petersburg was abolished by imperial ukase on account of its German derivation, and that of Petrograd substituted, a name that had already been used for many years by non-Russian Slavs, and which was consequently not new. The wildest scenes ever witnessed in Petrograd broke out early in 1917 and developed into the great revolution which swept away the Romanov family, broke the military power of Russia and eliminated her from the war as a belligerent. For nearly two years anarchy and wholesale murder prevailed in the city under the Kerensky and Bolshevik régimes, and at the close of 1918 there was no indication that the city was likely to settle down in the near future to normal life under a stable government. See KERENSKY; LENINE; RASPUTIN; RUSSIA; RUSSIAN REVOLUTION; TROTSKY; WAR, EUROPEAN.

Consult Buchanan, (Miss) M., 'Petrograd: The City of Trouble' (London 1918); Dobson, G., 'Saint Petersburg' (New York 1910); Elaroff, 'Saint Petersburg et ses environs' (Saint Petersburg 1892); Stevens, W. B., 'Petrograd, Past and Present' (London 1915; Philadelphia 1916).

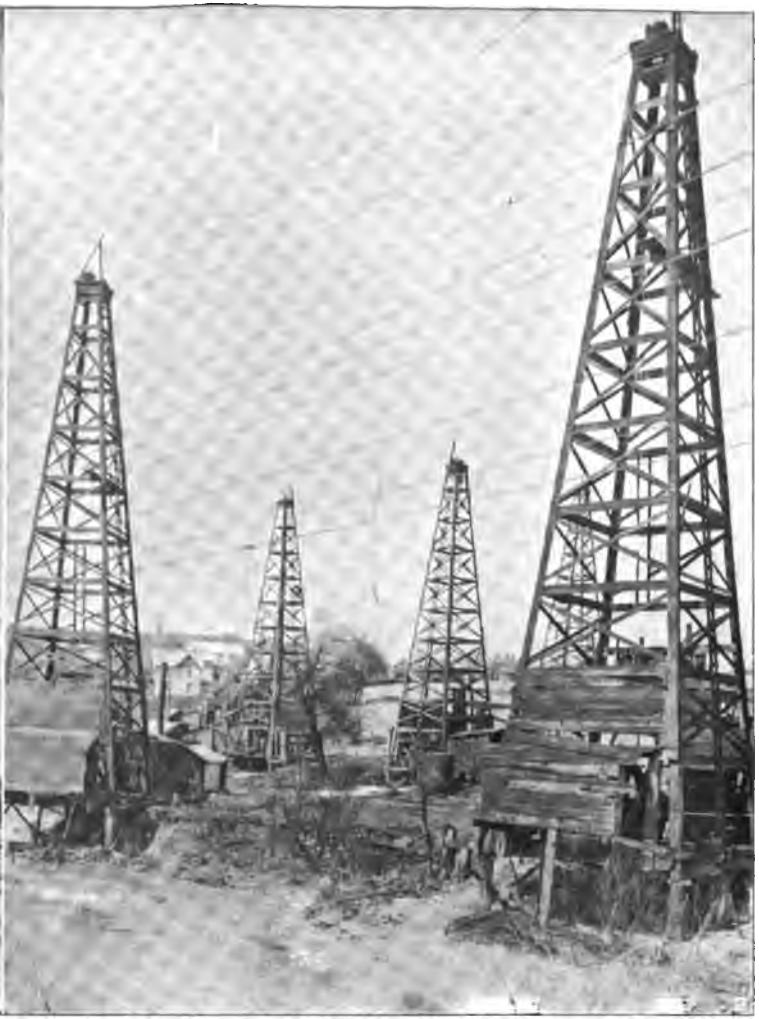
HENRI F. KLEIN,
Editorial Staff of The Americana.

PETROGRAPHY, the science which deals with the description of individual rock formations. In modern methods the microscope and chemical analyses play a conspicuous part. Strictly considered, petrography confines itself to the study of the rock specimen *per se*, while the study of the field relations and of the origin of the rock falls more properly under the science of petrology. The two are, however, often used synonymously, and often interchangeably with lithology. The latter term, however, is preferably limited to the discussion of rock material as distinguished from other natural substances.

PETROLEUM, the general name applied to one of the three great classes of natural oily liquids, the other two being the essential oils and the fixed oils. (See OIL). It is obtained ready formed from the earth and from various localities. It belongs to a great series of bodies grouped under the name «Bitumens» which together comprise a range of materials of the highest importance to the well-being of the human family. The familiar bitumens are the gaseous natural gas, the liquid, petroleum, the semi-liquids, maltha and asphalt pitch, and the solids, natural asphalt and ozokerit. The word is derived from the Latin, *petra*, rock, and *oleum*, oil, and literally means rock oil. It is also known in some parts of the world in its crude state as naphtha, derived from the Persian «nafata.» As used in the United States the term «naphtha» is applied only to one of the lighter products which is given off in the process of distillation. In Germany it is known as «erdoel» or earth oil and «steinoel»— stone oil; the French and Italian equivalent is «petrol.» Crude petroleum varies in specific gravity over a wide range. This characteristic of petroleum and its products is usually expressed in degrees Baumé, a type of hydrometer which found favor in the early days of the industry. Its readings are directly reducible to specific gravity through use of the formula $\frac{140}{130+B^{\circ}} = \text{Sp. Gr.}$ Water is

Photograph from Underwood & Underwood, N. Y

1 A Sinclair gusher in Texas oil field



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2 A group of oil wells, Pennsylvania

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1 A general view of the great oil field at Eldorado, Kansas
2 A battery of stills (right) and condensing plant (left) in a big oil refinery near Cushing, Oklahoma

10° Baumé. One of the heavy crudes from Wyoming approaches this gravity, while the amber varieties from Pennsylvania are as light as 46° to 48° Baumé. Most of the paraffin crudes (see classification below) take fire on application of a flame, at ordinary temperatures, due to the gasoline content. Others, like the natural West Virginia black oils, must be heated to 180° F. or above before they will give off inflammable vapors rapidly enough to produce a flash. Certain crudes are not frozen at 0° F., while others containing larger percentages of paraffin solidify at temperatures only slightly below normal. In color petroleum ranges all the way from a light straw through amber, red and brown to jet black. The transparent oils also exhibit a variety of color by reflected light.

Crude oils have been variously classified, preference now being given to naming them from the group of hydrocarbons representing the largest proportion of the crude. Nearly all contain percentages of the paraffins, of the olefins or ethylenes, of the naphthenes, and of various other bodies in smaller proportions, but because of the variable proportions of these groups, certain ones having strongly marked characteristics have been chosen as types and the two generally recognized are differentiated by Holde as: (1) the naphthenes, and (2) the paraffins. The first are those that are rich in naphthenes, low in paraffin (from 0 to 1½ per cent), containing little naphtha as well as very little kerosene but much lubricating oil, and frequently asphaltic bodies: Most of the California crude and that from the Gulf Coastal fields of Texas and Louisiana are properly naphthenes. They have been also called asphalt base crudes. Asphaltic or asphalt-bearing crudes would be a better designation. The paraffins or paraffin base crudes contain smaller quantities of naphthenes, larger proportions of paraffin, ranging from 3 per cent to 8 per cent, considerable amounts of naphtha and illuminating oils, and both light and heavy lubricating oils, the relative yields of the latter depending somewhat on the method of distillation. The Pennsylvania crudes are the best of this type. There are various grades between these two as well as those containing sulphur or pitch-like bodies or both. Some of the more recent writers are confining the term «asphalt» to the naturally existing body and the names «mineral» or «artificial pitch» to the semi-fluid product of petroleum used as an adulterant of the natural asphalt.

Geographical Distribution of Types.— The former divisions of the petroleum producing areas into rather definite sections in the United States are being disregarded because of the widening areas of such fields, and the separation has come to be based more and more on fundamental differences in the type of oil produced and its adaptability to refining needs. Thus the oils of the Appalachian fields are in the main paraffins free from objectionable sulphur and asphalt and they yield by ordinary refining methods high percentages of gasoline and illuminating oils. Contrasted with them is the petroleum of the Lima-Indiana fields which contains some asphalt though consisting chiefly of paraffin hydrocarbons, and is contaminated with sulphur compounds which necessitate special treatment for their elimination. Illinois oils contain varying proportions of both asphalt and paraffin and differ considerably as to specific gravity and distillation products. Sulphur is generally present but rarely in such form as to necessitate special treatment for its removal. Mid-continent oils vary in composition within wide limits, ranging from the naphthenes containing asphalt to the paraffins in which the asphalt content is negligible and which yield correspondingly high percentages of the lighter products of distillation. Sulphur is present in varying quantities in the lower grade oils, in certain of which, Healdton, for example, it exists in the form requiring special treatment for its elimination. Oils from the Gulf field exhibit a considerable variety, but many of the naphthenes are characterized by relatively high percentages of asphalt. Considerable sulphur is present, much of which, however, is in the form of sulphureted hydrogen and is easily removed by steaming before refining or utilizing the oil as fuel. Oils from Wyoming and Colorado are in the main paraffin hydrocarbons suitable for refining by ordinary methods. Certain of the naphthenes containing large percentages of asphalt and suitable only for use as a fuel are also obtained in the Wyoming fields. The California oils exhibit a variety of compositions, none of them containing hydrocarbons of the paraffin series and all of them containing more or less dense, asphaltic hydrocarbons. The phenols are a common constituent of the denser oils; many of them also contain sulphur. The chief products are fuel oils, illuminating oils, lubricants and artificial asphalt, though low percentages of naphthas may be derived from certain of the lighter oils, notably those of the Santa Maria, Sespe and Santa Paula fields in the southern part of the State. Canadian petroleum, like that from the Appalachian field, is classed as a paraffin.

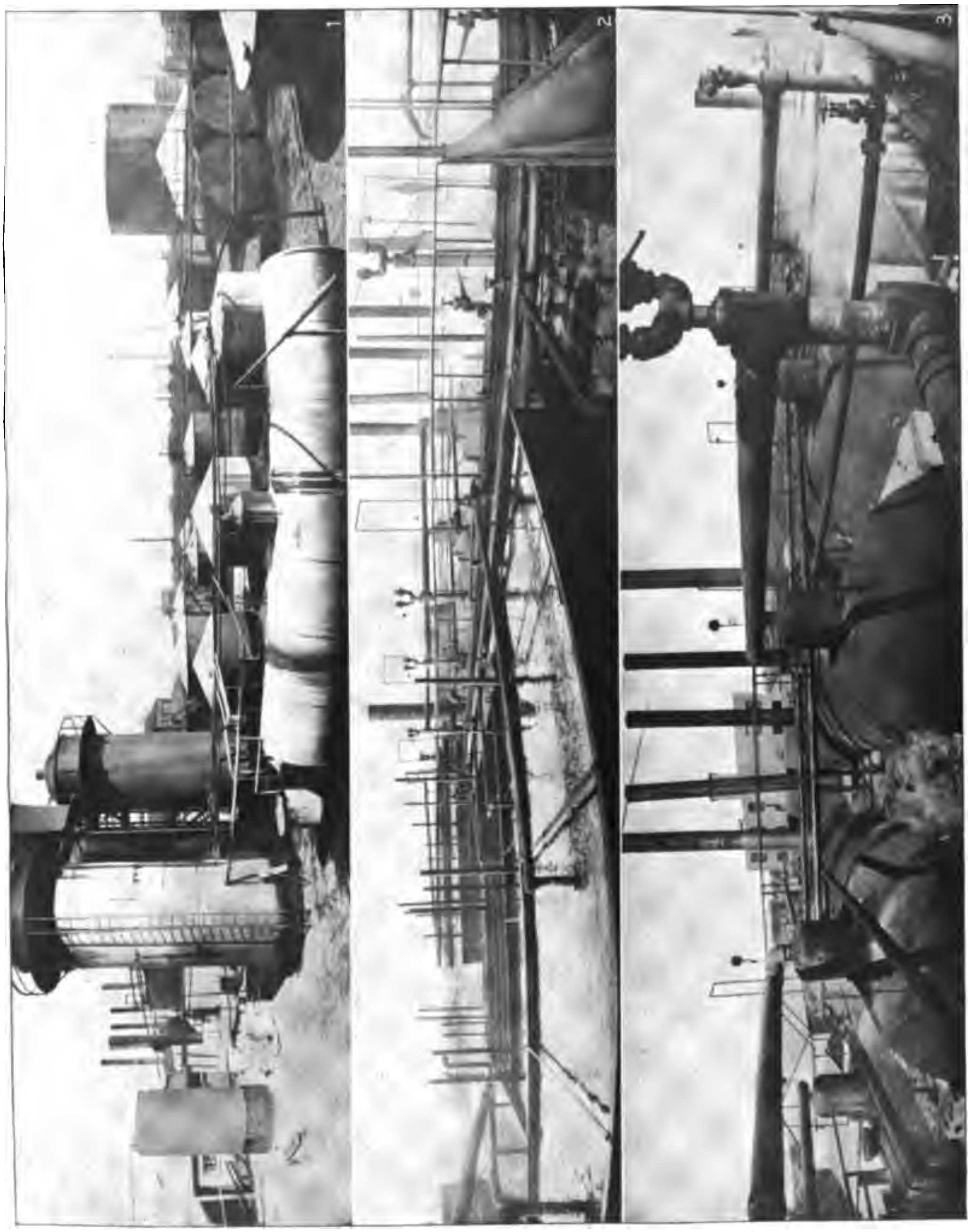
Chemistry.— Much work has been done in determining the actual chemical formulæ of the various hydrocarbons found in crude petroleum and its distillates, and many in the series of certain types have been identified. CH_4 is marsh gas or methane, the first of the series of the paraffins which have the general formula of $C_n H_{2n+2}$. Pentane, C_5H_{12}, is one of the lowest boiling point paraffins of commercial importance. It also has a low freezing point for which reason it is used instead of alcohol in thermometers for measuring very low temperatures. A «straight run» kerosene of this series contains a large percentage of tridecane, $C_{13}H_{28}$. One of the paraffin waxes having the unusual melting point of 167° F. is chemically $C_{35}H_{72}$. The members of this series are said to be saturated because the chemical bonds — linkages — are all satisfied. The olefins or ethylenes which have two unsatisfied linkages are unsaturated, and are soluble in sulphuric acid. This characteristic is made use of commercially in sweetening and deodorizing kerosene by treating with that acid. The olefins, named from olephiant gas, C_2H_4, the first member of the series, have the general formula C_nH_{2n}, and with the paraffins are known as open chain hydrocarbons. The naphthenes or cycloparafinns have the same chemical composition as the olefins but differ widely from them in physical characteristics, the theory being that the naphthenes are closed chains or closed ring hydrocarbons, in which the grouping of the elements in the molecule is not the same as that in the chain.

Mabery, whose studies of the petroleums have been of great scientific value, has identified members of the groups C_nH_{2n-2}, and C_nH_{2n-4} in oil from the Trenton limestone in Ohio. The next series C_nH_{2n-6} is represented by the aromatic hydrocarbons, benzol, toluol and xylol. They are found only in small percentages in Pennsylvania crude but certain of the petroleums from the Far East yield such appreciable quantities that they are being worked as a substantial source of supply of the aromatics. The aromatics are chiefly collected in the distillation of bituminous coal for the manufacture of gas for domestic purposes, but because of the adaptability of some of them to use in high explosives, such as picric acid and trinitrotoluol, «T.N.T,» it has become necessary to secure them from every available source.

Origin.— The question of the formation of petroleum is of great chemical as well as geological interest. The older hypothesis that petroleum was formed entirely from inorganic reactions has been modified during recent years through continued studies of the optical rotatory power of the crude oil (See POLARIZATION OF LIGHT) and for geological reasons. Such hypotheses were suggested by Mendeléeff and by Sabatier and Senderens. According to Mendeléeff petroleum resulted from the action of steam on carbides in the interior of the earth; according to Sabatier and Senderens hydrogen and acetylene (resulting from the action of water on alkali and alkaline earth metals and carbides) by contact with metallic bodies, acting as catalyzers, formed aliphatic and cyclic derivations according to conditions. The hypotheses proposed more recently favor in general the formation from organic material. This view is supported by the work of Biot in 1835 on the optical rotatory power of crude oil to which attention was again drawn by Walden and by Tschugajef and has recently been carefully studied and confirmed by Rakusin, by C. Engler and others. Differences of opinion exist as to whether the petroleum is derived from animal or from vegetable material, or from both. C. Engler first showed by experiment, after Hofer had concluded from geological evidences that petroleum was derived from marine deposits, that an artificial petroleum could be obtained by the distillation of fats. He carried out his experiments with the fat of marine animals. According to the theory of Engler, petroleum is formed from the fatty remains of all kinds of life after decomposition under pressure, and after the other accompanying matter (protein substances) has changed by putrefaction into water, soluble nitrogen and sulphur derivatives. The lighter hydrocarbons resulting from vigorous treatment of fatty acids (adipocere) containing paraffins, ethylenes and naphthenes are supposed to have polymerized to those of higher boiling points in the course of long geological period. Marcusson, thinks that the higher boiling point fractions of petroleum could not have formed from the same volatile portions, because the former have a greater optical rotatory power than the latter. The opposite view would seem to him the more reasonable one. Many of the bituminous deposits in nature, however, seem to point to a gradual transition from natural gas through the petroleums to the semi-liquid or more solid bodies. All the great pools of petroleum have been found immediately below impervious strata of the earth's crust. Where this crust has faulted, pressures from below, either gaseous, aqueous or from sheer weight of the earthy material, have forced the more plastic bodies to the surface where the transition has taken place. It cannot be stated that any one theory has found universal acceptance and it seems quite plausible that different kinds of petroleum may have been produced from different materials.

Geological Distribution.— In the Appalachian field the petroleum yielding strata belong to the Carboniferous and Devonian systems, the most productive including the Mahoning sandstone and the Bradford «third oil sand» immediately underlying the Devonian shale. However, every well-defined and persistent sandstone, discovered below the Pottsville conglomerate, has produced oil or gas in paying quantities. In Kansas and Oklahoma they are generally found in Carboniferous sandstones. The principal oil horizon of Canada is confined to the Corniferous limestone, still older than the Devonian shales; in Indiana and Ohio, the Trenton limestone is the chief source of oil and gas; in Colorado, northern Texas and Louisiana it is found in the Cretaceous; in California chiefly in the Miocene Tertiary; in southern Texas and southern Louisiana, in association with salt domes which also carry limestone and gypsum, while in Europe it is found in the Tertiary.

Early Uses of Petroleum.— The use of petroleum, in its semi-liquid and solid forms, was common among the ancient nations of the East. The «slime» noted in the Old Testament, as employed in the construction of the Tower of Babel, was, without doubt, partially evaporated petroleum. The ruins of Nineveh and Babylon reveal its use as a bond in cementing structures of brick at least 2000 B.C. Herodotus, the Greek historian, mentions the oil springs on the island of Zante and the asphaltic deposits, which were carried down by the river Is and collected by the early Babylonians. Bitumen was an article of commerce in the region of the Dead Sea and was transported into Egypt and sold for embalming purposes centuries before the time of Christ. «Sicilian Oil» obtained from natural springs near Agrigentum, on the island of Sicily, was burned in the lamps of the temple of Jupiter about the beginning of the Christian era. This is the earliest record of petroleum being used for illuminating purposes. A Roman general built a bridge across the Danube about the year 100 A.D., near the city of Severance. The piers were of brick, cemented with bitumen. Two of these ancient piers remain to this day on the banks of the Danube, in which the outer layers of brick have crumbled away, leaving the black pitchy matter protruding. Historical references to the early knowledge and use of petroleum in Galicia, Persia, India, China and Japan are very numerous. The «holy fire» from the naphtha and natural gas springs of the Apsheron Peninsula, on the borders of the Caspian Sea, has been known and worshipped by certain sects among the Persians for from 2,500 to 3,000 years.



Muskogee (Oklahoma) Refinery — Stills and Stock Tanks

On the western continent this important mineral product was known to the aborigines centuries before the discovery by Columbus. The presence of pits, excavated for the purpose of collecting oil, along the waters of Oil Creek and French Creek, bear witness to this fact. Many of these were from six to eight feet square and varied in depth from 4 to 12 feet. They were lined with heavy timbers and were always to be found in the valleys and along streams where natural seeps of petroleum existed. They were not constructed by the Senecas or other Indian tribes that occupied the territory, when the first white man appeared in America. They were, doubtless, the work of the same race of people who developed the copper deposits of Lake Superior, the lead ores of Lexington, Ky., and built the great mounds in Ohio and other of our Western States.

The earliest mention of petroleum in the United States was in 1627 by a French missionary, who described the famous petroleum spring near Cuba, in western New York State. The first mention of petroleum in Pennsylvania was by a Moravian missionary who visited the region in 1767 and described the petroleum bubbling up in springs and from the beds of creeks, accompanied by natural gas. Many subsequent travelers, who penetrated the almost unbroken wilderness in after years in southwestern New York, northwestern Pennsylvania and southeastern Ohio, mention the existence of petroleum and natural gas. These explorers were guided to these localities by the Indians, who usually collected sufficient petroleum from the surface of the streams for a fire. This phenomenon was regarded by them with religious awe and superstition.

The artesian well driller, in search of salt brine in subsequent years, demonstrated the existence of petroleum in greater or less quantities, accompanied by natural gas, both of which were considered a source of annoyance and danger, over a large area in the Ohio Valley reaching from Freeport, on the Allegheny River in Pennsylvania, to Burkesville, in southeastern Kentucky, and from the waters of Duck Creek, in Washington County, Ohio, to a few miles above Charleston, on the Big Kanawha in West Virginia. The last-named locality has the distinction of containing the pioneer salt brine well of the United States, which was drilled by the Ruffner Brothers in 1808. They employed the most primitive appliances, but successfully cased off the weaker salt brine, adopting methods that are now employed in sinking deep artesian wells of every kind. About the year 1810 the first salt wells were drilled at Tarentum, Pa., followed by those on the Big Sandy, on the borders of Kentucky, which also produced considerable petroleum and natural gas associated with the salt brine. About the year 1829 a well was drilled for salt near Burkesville, in Cumberland County, Ky., which struck a great reservoir of petroleum; the oil flowed into the Cumberland River nearby, caught fire and produced a conflagration on the surface of the river for nearly 50 miles. For a number of years after, this well continued to flow, and a portion of the product was bottled up and marketed under the title of “American Medical Oil, Burkesville, Ky.”

From the year 1848 to 1856 Mr. Samuel Kier, of Pittsburgh, Pa., bottled the petroleum produced from the salt wells at Tarentum and sold quantities of it for medicine under the name of Seneca Oil, which name has been given it from the oil produced by the celebrated spring near Cuba, N. Y., whose product was also sold for medicinal purposes.

A portion of the petroleum from these wells was used in its crude state for illumination, but, because of the smoke and offensive odor, it was unfit for burning indoors. Mr. Kier of Pittsburgh, Pa., also made a number of experiments and succeeded in manufacturing an illuminating oil, but, owing to the crude and imperfect methods employed and the faulty character of the lamps, it did not become popular as a source of artificial light. In the meantime other minds were at work on the problem of supplying the world with a cheap, safe and efficient illuminant, to take the place of the beeswax and tallow candle and the greasy whale oil lamp, which were then the common sources of artificial light in general use. The decline in the whale-oil industry, owing to the growing scarcity of the animals in the high seas, threatened the total extinction of the supply of sperm and whale oil.

The Shale Oil Industry.— To meet the emergency, manufacturers turned their attention to the shale-oil industry, which had already made considerable progress in Scotland and some other parts of Europe. By distillation it was found possible to extract a rich paraffin oil from the bituminous coal shales and out of this was manufactured a very fair grade of illuminating oil. The first patent for refining coal oil (as it was called) was granted to James Young of Manchester, England, in 1850.

The same process was patented in the United States in 1852. Dr. Abraham Gessner patented his illuminating oil, which he called “kerosene,” and was obtained from the same sources in 1854. By 1859 the shale-oil industry had made considerable progress and there were nearly 60 establishments engaged in its manufacture. It was the progress made by this industry that paved the way for the almost instant success of refining crude petroleum. But the discovery of the latter in commercial quantities at Colonel Drake's experimental well in 1859 rendered the laborious process of obtaining a crude distillate from the shale rocks no longer necessary and speedily brought about the abandonment of the shale refineries. A number of them immediately took up the new discovery and adapted their works to the manufacture of illuminating oil from the crude product that they secured from the Pennsylvania oil regions. Between 1853 and 1860 four large distilling plants for the manufacture of shale oil were erected on the Allegheny River, near Freeport, Pa., eight miles above Tarentum. A number of factories were established along the New England coast, which used the boghead coal, obtained in Scotland, for distilling purposes. Albertite, from Nova Scotia, was employed in some Maine establishments, and several manufactories were erected in the interior for distilling oil from the Breckenridge cannel coal obtained in Kentucky and from the Grahamite deposits of West Virginia. The principal points of manufacture were at Canfield, Ohio; Ritchie Mines and Peytonia, W. Va., and Cloversport and Maysville in Kentucky.

Distribution of Petroleum.— The United States leads the world in the production of petroleum as well as in the manufacture of refined oil. For several years it was surpassed by Russia, but recent discoveries of enormous supplies in the Mid-Continent region together with the rapid development of the California oil fields have placed the United States once more in the first rank of oil-producing countries. Outside the United States, petroleum is obtained in commercial quantities in other countries ranking in production in the following order: Russia, Mexico, Dutch East Indies, Rumania, India, Japan and Formosa, Peru, Germany, Trinidad, Argentina, Egypt, Canada and Italy.

Petroleum in the United States.— For years the world was almost dependent upon the oil fields of Pennsylvania for its supply of illuminating oil and the American product dominated the markets of the world. Developments gradually extended to the Northeast and Southwest, taking in several counties in the lower part of western New York and covering large areas of territory in West Virginia and southeastern Ohio. Then followed the discovery of oil in the Trenton limestone formations of northwestern Ohio and Indiana. Up to the year 1901 almost the entire production of the United States came from five States east of the Mississippi, namely — New York, Pennsylvania, West Virginia, Ohio and Indiana. In 1901 the wonderful petroleum fields in Texas were opened up and California and Kansas came into prominence as producing sections. At the present time (1918) the production of the Western States surpasses that of the Eastern, and while the original territory producing paraffin base oil appears to be on the decline there are immense fields opening up west of the Mississippi. In 1907 Oklahoma advanced at once to the first rank as a producing territory, going beyond California, notwithstanding the fact that during that year she increased her production nearly 20 per cent. Oklahoma still holds first position, while Texas, Louisiana and Illinois have shown marked developments. The latter State reached its largest yield in 1908.

A table prepared under the direction of the Secretary of the Interior, published in February 1916, estimates that the oil fields of the country are exhausted to an average of 32 per cent, based on the present method of production, but that the fields already being worked can reasonably be looked to for the production of an additional 7,629,000,000 barrels of crude petroleum. A competent authority stated in July 1917 that, «this country is producing oil at the rate of about 300,000,000 barrels a year, but it is using it at the rate of about 335,000,000 barrels per year. The amount of crude oil in storage (all grades) 1 May 1917 was 165,688,797 barrels.»

«In 1910 there were 400,000 automobiles in use in the United States. In 1916 the number was 2,250,000. To-day there are more than 4,000,000 cars, demanding more than 2,000,000,000 gallons of gasoline a year and other uses of gasoline and oil are expanding upon an enormous scale.»

Casing-head Gasoline.— While the enormous quantities of natural gas gasoline being recovered from the great natural gas fields will go far to make up the shortage, it is apparent that the gasoline situation is becoming acute. At the present rate of consumption all the surplus stocks of crude oil above ground will have become exhausted within five years unless production is increased in a substantial percentage, or methods are discovered under which more of the petroleum can be obtained from the oil sand. In 12 States in 1916 there were 596 plants which produced 103,492,689 gallons of raw gasoline from natural gas. Much of it was obtained from casing-head, oil-well or «wet» natural gas, and both by the compression and condensation and the absorption methods. The former is the familiar one applied to liquifying gases. The absorption method is carried out in two ways. In one the gas is bubbled through an oil of higher boiling point than gasoline like a 300° F. fire test burning oil, until it will no longer absorb all the suspended gasoline. The oil is transferred to a still, where it is heated and the gasoline recovered by ordinary fractional distillation. In the other the gas is absorbed directly into a naphtha of higher boiling point until the mixture is brought down to or below the boiling point of commercial gasoline. This grade is then steam stilled or weathered to remove the excess of light ends boiling below 140° F. «Gravity» is no longer a safe guide in choosing a gasoline for automobile use, because a mixture of a casing-head gas and kerosene in the proportions to make a 70° gasoline might contain so much low boiling material as to interfere with carburation and make it unsuitable for engine fuel. The ideal fuel contains enough low boiling point fractions for easy starting and not so much «heavy end» as to interfere with instantaneous combustion of the atomized mixture.

It is easily understood that this casing-head gasoline is, therefore, becoming of commercial importance not only as a conservancy of fuel but because it makes possible the use of naphthas too heavy for service alone as an engine fuel, by raising the boiling point of the mixture to a satisfactory degree. It adds to the available supply besides its volume the quantity of heavy naphtha not otherwise usable for the purpose. It is estimated that the increased quantity of commercial gasoline represented by the output of casing-head gasoline for 1916 amounted to approximately 200,000,000 gallons. Natural gas containing as low as one pint of gasoline per 1,000 cubic feet is now profitably treated. Casing-head gas contains as high as 3.6 gallons per thousand cubic feet.

The Drake Discovery.— Previous to 1858 nothing had been accomplished toward establishing the fact that petroleum existed in almost inexhaustible quantities and that large supplies could be obtained by simply drilling wells into the rocky structure of the earth. The natural petroleum had been analyzed by eminent chemists, its properties as an illuminant had been pretty well established and in a small way it had become an article of commercial exchange. Its production, however, was confined to collecting it by various crude and imperfect methods from the oil springs and streams that bore petroleum on their waters, in various parts of the country. It was obtained in considerable quantities from the salt wells of Tarentum, Pa., and the lower Allegheny Valley, and it was gradually finding a market in Pittsburgh and New York for various purposes. On 4 March 1858 nine barrels of oil from Tarentum were shipped to the Kerosene Oil Company at New York City and sold for $275.19. From such small beginnings rose an industry that was to revolutionize the methods of artificial lighting in general use and add millions of dollars to the combined wealth of the United States.

The Pennsylvania Rock Oil Company, the first of its kind, was organized in New York in December 1854 by George H. Bissell and Jonathan D. Eveleth. They were prosperous New York attorneys, who had become interested in petroleum, and had secured some land on Oil Creek from Brewer, Watson and Company, a firm of lumbermen operating a lumber mill below Titusville, Pa. Their first idea was to collect the oil from the surface springs and they hoped by systematic work to secure it in sufficient quantities to market it in the East. Professor Benjamin Silliman, Jr., of New Haven, Conn., had made an exhaustive analysis of the samples of oil submitted to him by Messrs. Eveleth and Bissell, and his report confirmed their highest expectations as to the value of the product. The efforts of the company to obtain petroleum by such primitive methods proved far from successful, and another company was formed in Connecticut for the same purposes. It took over the property of the New York concern and later on was succeeded by the Seneca Oil Company, in which Col. E. L. Drake of New Haven became interested. Drake was sent to Titusville, Pa., in 1858, and shortly after commenced preparation for drilling an artesian well in order to tap the hidden sources of the oil supply in the underlying rocks. He encountered many trials and difficulties, his partners lost faith in the enterprise and he was compelled to strain his own resources to the utmost in order to continue the project. His persistency was rewarded and on 28 Aug. 1859 the first oil well in the United States began producing at a depth of 69½ feet. The oil rose to within 10 feet of the surface and when the well was equipped for pumping it produced for a short time about 40 barrels a day. The product sold readily at 50 cents a gallon or about $20 a barrel. The news of the wonderful discovery spread over the country and created the greatest excitement. The production of the Drake well during the last four months of 1859 and the first four months of its existence is estimated at 2,000 barrels. Another well was completed near Rouseville, farther down Oil Creek, in December 1859, which pumped about eight barrels a day.

Hundreds of wells were then started in the Oil Creek Valley and up and down the Allegheny River, and the rush to engage in the new industry resembled greatly the excitement that followed the discovery of gold in California in 1849. Oil was found the following year at Tidioute, Henry's Bend, Franklin and Smith's Ferry, Pa., and the production of the year 1860 amounted to over 500,000 barrels. Most of these wells were drilled only to the first sand, as the upper producing formation of the Venango group is commonly termed, and dry holes were numerous in territory that in after years proved highly productive from the deeper sands.

In 1861 the first flowing well was struck on the Funk farm, near Rouseville, Pa. It was 400 feet in depth and the oil was obtained in the third sand. This well was followed by others that spouted from 2,000 to 3,000 barrels a day. The market was overstocked and prices went down to the lowest point known in the history of the oil industry. The estimated production for 1861 was 2,113,609 barrels, but thousands of barrels flowed upon the ground and were carried away by the waters of the Oil Creek and the Allegheny River.

The oil developments, which were at first confined to the lowlands along the valleys of Oil Creek, French Creek and the Allegheny River were rapidly extended in all directions and test wells in search of the hitherto little-known product were drilled miles away from the original strike. An era of oil stock companies ensued, which came to an end in 1866-67 after causing heavy losses to the people of this country, amounting to many millions of dollars. The rise and fall of Pithole occurred during this period, which was almost duplicated a few years later in the history of Petroleum Centre. Both were flourishing towns in Venango County, Pa., but the exhaustion of their big wells and the removal of their population to fresh centres of oil development caused their whole or partial abandonment. At present Pithole is nothing but a memory, while the name of Petroleum Centre is still preserved by a flag-station on the Pennsylvania Railroad, between Oil City and Titusville, Pa.

From Venango County the oil developments were extended southward into Clarion, Butler and Armstrong counties, and within 15 years after the Drake strike production had risen to nearly 30,000 barrels a day. In December 1874 the initial well of the great Bradford oil field in Pennsylvania was opened up, but it was not until 1878 that the exodus of lower country operations to the prolific districts of the Northeast began in real earnest. For three years this new district, which covered over 100,000 acres, extending from Cattaraugus County, in New York State, through the central portion of McKean County, Pa., was the centre of an unparalleled activity. New wells were drilled and production increased at a rapid rate, beyond the ability of the pipe-line companies to take care of the oil. In July 1880 the production of the Bradford field reached 100,000 barrels a day, but not more than 80,000 barrels were run into the storage tanks of the transportation companies. The remainder ran to waste. The same year the developments in Allegany County, in New York State, began to attract attention, and it likewise proved a very rich and prolific source of oil production. Stocks were steadily increasing during this time, and prices going down, but there was no cessation of drilling operations. Bradford and Allegany were followed by the discovery of the Cherry Grove district in Warren County, Pa., which came into prominence during the summer of 1882. It furnished a number of spouting wells, such as the oil country had not known since the development of the fourth sand belt in Butler County, about 10 years previous. The pool, however, was quickly drilled over and the "gushers" declined to pumping-wells of small calibre. Cherry Grove was followed by Cooper and Balltown, both of which produced a large amount of petroleum and helped swell the constantly increasing stocks in the custody of the pipe-lines. These three last-named pools obtained their oil from white sand formations, similar to those of Venango and Butler counties, but they were found at a greater depth and of a different geological horizon. The Bradford and Allegany oil is found in a dark, chocolate-colored formation commonly known as the "black sand" to distinguish it from the white. These sands are all found below the regular Venango group, which was the first and only oil formation known to the early drillers and operators. With the advent of the Cherry Grove field in 1882, oil declined to less than 50 cents a barrel, and the steady accumulation of the stocks made the outlook very discouraging for the oil producers. By August 1884 the gross stocks had reached over 40,000,000 barrels and its depressing influence upon prices of crude petroleum was freely admitted by everyone. In 1884 another big white sand development was opened up in Washington County, Pa., and the attention of oilmen was again attracted toward the Southwest. These developments were extended into West Virginia and southeastern Ohio, and for many years have proved the sources of a great supply of high-grade petroleum. In 1891 the phenomenal oil-field at McDonald, in Allegheny and Washington counties, Pa., was opened up and ran the production for that year up to the largest amount that had ever been recorded. Mannington and Sisterville, in West Virginia, were the next pools of importance, and they were followed by others in succession, all of which helped to maintain the supply.

For years the production of Pennsylvania oil had steadily exceeded the demand, stocks continued to accumulate and the price ruled very low. In 1887 the market declined from an average of 71 cents in January to 59¼ cents in July. A movement among the oil producers was then started which resulted in the formation of the Producers' Protective Association, and an agreement was entered into to stop drilling new wells and shut in a third of the daily production. The object was to get rid of some of the surplus stocks and increase the price of oil at the wells. The movement proved a remarkable success. The net pipe-line stocks which at the close of July 1887 amounted to over 32,000,000 barrels, by the close of December 1888 had become reduced to 18,604,474 barrels. The production for the year 1888 showed a decline of over 5,000,000 barrels from that of the previous year. At the same time it was over 9,000,000 barrels less than the consumption and the market value of the oil, which averaged 66⅝ cents per barrel in 1887, increased to 87 cents in 1888 and 94⅛ cents in 1889.

Trenton Rock Oil Fields.— For nearly 30 years Pennsylvania had maintained her position as the leading oil-producing State of the country, and during the first 10 years after Drake's discovery had been the source of the world's principal supply of illuminating oil. In 1885 oil was discovered in the Trenton rock at a well drilled for natural gas, near Lima, Ohio, which proved the beginning of the developments in northwestern Ohio and Indiana. This oil was of different quality from that produced in Pennsylvania and was impregnated with sulphur. It, however, had a paraffin base, but its value for illuminating purposes was not at once established. For many years it was marketed as a fuel oil, the supply being very much below the demand. When a process was found for converting it into an acceptable illuminant its market value was considerably enhanced. The production of northwestern Ohio, which amounted to 1,079,025 barrels in 1885, in 11 years increased to 20,575,138 barrels, and at the close of 1896 there was a surplus stock of over 25,000,000 barrels. Indiana came into prominence as an oil-producing State in 1891 and grew in importance until it reached its highest production in 1904 with a yield of 11,339,124 barrels. The production has gradually diminished, and in 1916 it was only 769,036 barrels. The Indiana oil is of the same general character as that of northwestern Ohio and comes from the same Trenton Rock formation. The yields from Kentucky and Tennessee are usually grouped because the quantity from the latter State has been so small. The oil from both States is of paraffin base though heavier in specific gravity than the usual run from the Appalachian field. This district produced in 916 1,203,246 barrels and gives promise of even greater yields for the future.

West of the Mississippi.— Oil has been produced in California since 1876, but not until 1895 did it reach the million barrel mark. In 1903 California advanced to first place as a producing State, which position it held, except the years 1907 and 1908, continuously until 1915 when its production of 86,591,535 barrels was surpassed by the 97,915,243 barrels produced by Oklahoma. It is still far ahead of every other competing State. The product is marketed largely for fuel purposes for the railroads of the Southwest, for steamships, including those of the navy, and for manufacturing purposes. The production is chiefly asphaltic, in some respects similar to that from the Gulf Coastal field, all of which are now classified as naphthene base oils. The percentage of illuminating oils and gasoline is small, but the lubricating oil manufactured from these crudes is of good quality.

For commercial purposes it is customary to group under the title Mid-Continent field, the areas of oil production in Kansas, Oklahoma, northern and central Texas and northern Louisiana. For many years the oil territory in Kansas was confined to a small area around a refinery at Neodesha, in Wilson County, where a small refinery was erected and connected with the wells by pipe-lines. The developments were gradually extended, but no great volume was produced until 1903 when the yield was 932,214 barrels. The next year the record was 4,250,779 barrels, and Oklahoma also became a million-barrel State. The production in the latter State increased so enormously that its yield of 43,524,128 barrels in 1907 exceeded the California yield by more than 4,000,000 barrels. Its production for 1915 was 97,915,243 barrels, again exceeding California, but the banner year was 1916 when the yield was 107,071,715 barrels. The first refinery in this field was built in 1892; the second one in 1904, and since that year, with the increased production, many refineries have been erected. In 1916 there were 71 independent and three Standard Oil Company refineries in operation, with an approximate investment of $107,000,000 and consuming upward of 208,000 barrels of crude per day.

One of the results of the enormous production in this field was the laying of pipe-lines so that the crude oil could be delivered to the large refineries of the Standard Oil Company at Whiting, Ind.

Texas.— Oil was discovered in Texas in 1867, the first development having been located about 15 miles south of Nacogdoches. About 100 wells were drilled and a pipe-line built to the nearest railroad. This oil was of fair lubricating quality, but the yield was very small and the field quickly lapsed into disuse. In June 1894 in the process of drilling an artesian well for water near Corsicana, a good flow of oil was struck at a depth of 1,027 feet. The oil was cased off and the well continued down to 2,470 feet where a good flow of warm water was encountered, but no more petroleum revealed itself. This was the beginning of the first successful oil development of any commercial importance in Texas. It was over two years later before outside capital was attracted to this district which in 1897 was credited with a production of 65,975 barrels. This was increased until it reached the maximum of 28,136,189 barrels in 1905. The yield fell off for the several succeeding years but started upward in 1911, and in 1916 became the third in order of quantity produced with 27,644,605 barrels. The great oil field in southeastern Texas was opened up in January 1901, when a well drilled on Spindletop, near Beaumont, in Jefferson County, started to flow at 70,000 barrels a day and proved the forerunner of developments that soon placed the Lone Star State in the front rank of oil-producing sections of the world. Oil is obtained from two formations in this State, in the northern and central portions from strata, in the former from sandstone belonging to the upper Carboniferous, and in the central from sandstones or other porous rocks of the Cretaceous and Tertiary, and in the Coastal plain from domes associated with rock-salt and gypsum. Here the reservoir rock is generally either porous dolomitic limestone or sandstone ranging from the Cretaceous to the Quaternary.

Louisiana.— Oil was discovered at Jennings shortly after the opening of the prolific field in southeastern Texas. In 1911 the State produced more crude than the combined production of Pennsylvania and New York. Some of the largest wells in the country were found in Louisiana, and to the close of 1915 its yield was on the increase, that year amounting to 18,191,539 barrels. For 1916 the quantity produced was 15,248,138 barrels. The oil in the northern part of the State is from the same strata as found in central Texas; that from the southern part from domes similar to those of the Gulf Coastal Plain of Texas.

Rocky Mountain Field.— For convenience, all areas of production of petroleum in Colorado, Wyoming and Montana, as well as a number of areas of prospective production in Utah and New Mexico, are classified as the «Rocky Mountain Field.» Various grades of petroleum are found both in the strata of the Carboniferous and the Cretaceous. The oils from the former range in gravity from 18° to 24° Baumé are asphaltic and are utilized chiefly for fuel. Those from the Cretaceous rocks range from 32° to 48° Baumé, are of paraffin base and in wide demand for refining.

Colorado.— The oil production of Colorado is confined to a small pool in the vicinity of Florence, and another of still more limited dimensions at Boulder. It is of dark-green color and generally of paraffin base and above 31° Baume. It is all refined at Florence and marketed in the Rocky Mountain stations. In 1904 the production amounted to a half-million barrels, but it has almost continuously declined since that year, the production in 1916 amounting to only 197,235 barrels.

Wyoming.— The description of an expedition to Great Salt Lake written in 1894 refers to a spring of petroleum or mineral tar in the valley of Sulphur Creek. The emigrants collected it for medicinal purposes and for greasing their wagon wheels. The Carter Spring, six miles to the west, was discovered about the same time. Various other discoveries were made, but the first production marketed from drilled wells was from the Carter well in Uinta County. The first gusher wells were drilled in the Dallas field in 1883 and the first wells at Shannon on the north end of the Salt Creek field in 1880. The earlier discovered wells yielded heavy dark products chiefly valuable for lubricating purposes. Up to 1910 the production was nominal when it began to increase and passed the million-barrel mark in 1912. In 1916 Wyoming produced 6,234,137 barrels, and is becoming recognized as the dominant factor in the situation with respect to high-grade petroleum in western North America. The fact that the greater part of this yield consists of high-grade refining oil, capable of furnishing 15 to 25 per cent of gasoline by modern refining methods, indicates well for the local industry.

Montana.— In 1916 this State marketed 44,917 barrels of petroleum from the only district that had been developed commercially.

Utah.— The few wells developed in this State yielded in 1916 15,200 barrels. Plans were also made by two companies in 1917 for the erection of experimental plants for the distillation of oil shale which promises to become an important industry.

The quantities above given are in barrels of 42 gallons each and represent marketed production taken from government reports. In practically every State at the time these figures were compiled the actual production from the wells was greater, the difference going into storage tanks and not being available for publication. In some States this storage is now being drawn on, and as stated in another section of this article, at the present rate all the accumulated surplus will be used up within five years.

Production.— In the older fields where the oil wells are drilled through stratified rock, the ordinary method of procedure, after locating the well, is to sink a shaft, the same as for a water well, or to drive down a wooden or iron «conductor» through the soil nearly or quite to the bed rock. When the rock has been reached, the real drilling is begun with a string of tools consisting of rope socket, drilling jars, drill stem and bit. Various sizes of the latter are at hand and the one selected to start the hole with may be anywhere from 8 inches to 12 inches in diameter, depending on the known rock formation. The drill is raised by mechanical means and allowed to fall of its own weight, thus crushing its way through the strata until water is reached. An iron pipe or casing is then placed in the drill hole in such a manner as to exclude the water and below this point a drill of smaller size is used until water is again encountered. A pipe of smaller size is fitted within the first casing and this procedure repeated until the oil sand is reached. Usually it is unnecessary to case the lower part of the drill hole. Just before the producing oil sand is reached is a layer of impervious shale. Unless the oil starts flowing immediately, it is customary in some sections to continue the drilling for several feet into the oil-bearing sand, and after due preparation explode a charge of nitroglycerine at the bottom of the drill hole, which shatters the surrounding rock, forming a cavity in which the oil can accumulate. This cavity is then cleared of débris, and the pump, with all its appliances, placed in the well which is started on its career as an oil producer.

In several sections of the United States, particularly in Texas, the nature of the soil is such that cave-ins occur and the drill hole has to be carried down by other means. The rotating pipe method has been very useful for this work. The lower end of the drive pipe is supplied with a cutting tool on the plan of saw teeth and as the pipe is rotated it quickly cuts its way through the soft soil. These cuttings are removed from the drill hole or well by forcing downward through the inside of the drill pipe a stream of water. This passes out below the bottom of the cutting edge and floats the cuttings to the surface. When the line of rotating pipe is sunk to its length in the ground, another run is screwed into its upper end and this plan carried on until the well reaches either the oil sand or some obstruction requiring a different tool. With the use of different cutting edges, the rotating pipe can be forced through rock that is reasonably hard, and in the hardest strata the drilling is carried out by lowering steel shot into the bottom of the well and grinding this into the rock by means of the rotating pipe. The cone of rock within the tube is broken off frequently and brought to the surface.

In the Mid-Continent fields where gas is met at varying depths when in search of oil, a modification of the rotary method has come into use which has proven of great utility both in conserving the natural gas as well as in overcoming the troubles incident to the bubbling of the gas through the water or mud-laden fluid used in putting down the well. This modification consists in mixing in a separate tank from 5 to 15 per cent of clay with water and pumping this mixture down through the drill and catching it again when it comes up outside the casing, allowing it to pass through a separate tank where the drill cuttings drop out and the mud-laden fluid again returns to the tank from which it is circulated. The clay deposits as a thin layer of mud over the loose strata from which the gas flows into the well and eventually so fills the openings as to effectively shut out the gas. The pressure necessary to force this fluid down is estimated to be from 500 to 600 pounds per square inch in a well 1,000 feet deep and increasingly greater in deeper wells. The depth of oil wells naturally varies in different fields, but it is noteworthy that the Drake well, the first one drilled, was but 69½ feet deep and may be considered remarkable in many ways. Some of the West Virginia wells, drilled into the fifth sand, approach 3,400 feet in depth.

Transportation.— The crude petroleum from the Oil Creek Valley was first transported down Oil Creek and Allegheny River in barrels on barges to Pittsburgh, where it found a ready market. The barrels were of oak with iron hoops holding about 42 gallons each, which doubtless is the origin of the unit of capacity still in use in tabulations of petroleum and its products. It was also hauled overland in wagons to Union City and Garland, where the barrels were loaded on cars for shipment by rail, to points East and West. The boats loaded with empty barrels were towed up the creek by horses or mules wading in the stream, there being no towpath. After filling, the barrels were again loaded on the boats which were released at the next freshet. As a matter of economy, two upright wooden tanks or cisterns, holding 2,000 gallons each, replaced the barrels on barges and platform cars, and later boats having a number of water-tight compartments took the place of barrel barges. In 1871 the wooden tanks began to disappear, their place being supplied by the horizontal, cylindrical tanks now in general use.

The first pipe-line was three miles long and was laid in 1862. It was of ordinary four-inch gas pipe with caulked joints. The leakage was so great that but little oil was delivered at destination and the line was soon abandoned. However, it existed long enough to arouse the opposition of the teamsters who had been hauling the oil out of the district and who saw, in its successful operation, the ruin of their occupation, and much rioting followed. In 1865 the first successful line was constructed and was the forerunner of this most useful method of transportation. It connected the Shaffer Farm with Benninghoff Run, was of four-inch pipe and four miles long. Now the entire production of the Eastern oil fields is handled by pipe-line systems which cover the oil country with a net-work of gathering lines that connect the small receiving tanks of the producers with the large storage tanks of the pipe-line companies. The first seaboard pipe-line was completed about 1879 and its route was from Olean, N. Y., through the southern part of New York State to Saddle River, N. J. At this point is was divided, one branch going to the Standard Oil Company's refineries at Hunter's Point, L. I., and another to Bayonne, N. J. The growth of the pipe-line has been one of the most remarkable developments in connection with the growth of the oil industry. The Transit line to New York conveyed the petroleum of the great Bradford oil field to the Eastern seaboard and supplied the markets of the world with American illuminating oil. The Tide Water pipe-line which antedated the New York Transit, did not succeed in reaching the Eastern coast until many years later. Its route was through Pennsylvania, from Bradford to Williamsport, where it halted and shipped the oil of the Bradford field in tank cars to New York and Philadelphia.

At the present trunk lines convey the product of the Pennsylvania, West Virginia, New York, Ohio, Indiana, Kentucky and Tennessee oil fields to New York, Philadelphia, Baltimore, Cleveland, Pittsburgh and Chicago. With the line now completed from Kansas City to Whiting, Ind., it is possible to pump oil through iron pipes from the remotest sections of the Kansas and Oklahoma oil fields to the Atlantic seaboard. Of the great trunk lines now in operation, the New York Transit extends from Olean to New York, the Southern Pipe Line from West Virginia to Philadelphia, while the Buckeye Pipe Line cares for the production of the Ohio and Indiana fields. The Tide Water Pipe Line Company transports oil from the Allegany, N. Y., and Bradford, Pa., oil fields to the refineries at Bayonne and Philadelphia. The United States Pipe Line Company was the first to undertake the transportation of refined oil through pipe-lines. It has a double line, one for conveying crude and the other refined oil. It receives its supply of crude oil from the Producers and Refiners Oil Company, a gathering line, which extends through northern Pennsylvania into the oil fields of eastern Ohio and West Virginia. Its refined oil, which it ships to New York, is obtained from the refiners of Oil City, Titusville, Warren and Bradford, Pa. There are a number of minor companies with lines that penetrate various sections of the Pennsylvania and Ohio oil regions. Pipe-lines form an important part of the transportation system in Texas and California.

These lines are of pipes of various sizes from four inches to eight inches in diameter. From Kansas City to New York, much of the way the lines are in pairs, so that the total length approaches 3,000 miles, holding approximately 760,000 barrels. This is dead capital. At the price at which Mid-Continent oil was quoted during May 1917 this had a total value of $1,500,000.

The pipe-line is of special construction of wrought iron, lap-welded and tested to 1,200 pounds pressure. At distances of approxi-

PIPE-LINE STATISTICS.

	Runs from Wells barrels, 1918	Other receipts, barrels, 1918	Deliveries, barrels, 1918	Gross stocks, barrels, 1918
BUCKEYE PIPE LINE (LIMA)				
February	117,444	1,936,738	2,088,141	1,627,210
Total, 12 months	1,832,297	26,595,259	29,035,722	....
BUCKEYE PIPE LINE (MACKS)				
February	260,683	1,778	212,529	400,004
Total, 12 months	3,474,468	39,506	3,576,706	....
EUREKA PIPE LINE				
February	515,959	1,090,463	1,710,128	1,322,343
Total, 12 months	6,968,028	13,705,838	20,946,559	....
NATIONAL TRANSIT				
February	176,415	1,302,108	1,405,591	772,292
Total, 12 months	2,456,955	17,971,908	20,363,213	....
SOUTHWEST PENNSYLVANIA PIPE LINES				
February	100,477	917,150	995,081	464,195
Total, 12 months	1,447,475	11,908,053	13,401,598	....
INDIANA PIPE LINE				
February	13,434	2,274,967	2,384,029	741,910
Total, 12 months	189,351	32,262,102	32,320,159	....
CUMBERLAND PIPE LINE				
February	284,995	927	242,970	138,966
Total, 12 months	3,276,591	12,192	3,214,343	....
SOUTHERN PIPE LINE				
February	....	1,383,355	1,321,847	624,030
Total, 12 months	....	16,638,804	16,575,885	....
CRESCENT PIPE LINE				
February	....	84,125	112,659	138,766
Total, 12 months	....	1,786,471	1,758,567	....
NEW YORK TRANSIT				
February	11,678	1,027,547	1,286,387	852,769
Total, 12 months	163,486	14,720,206	15,393,692	....
NORTHERN PIPE LINE				
February	....	1,193,155	1,213,316	536,311
Total, 12 months	....	17,738,772	18,266,273	....
TIDE WATER PIPE LINE (EASTERN DIVISION)				
February	100,840	....	78,712	....
Total, 12 months	1,365,706	....	1,723,865	....
PRODUCERS' AND REFINERS' OIL COMPANY				
February	218,421	....	153,409	348,804
Total, 12 months	2,185,472	....	2,181,470	....
EMERY PIPE LINE COMPANY				
February	23,079	....	19,835	21,065
Total, 12 months	318,051	....	311,318	....
ILLINOIS FIELD				
ILLINOIS PIPE LINE				
February	721,234	3,926	787,840	1,928,769
Total, 12 months	10,514,716	2,224,963	13,794,080	....
TIDE WATER PIPE LINE COMPANY (WESTERN DIVISION)				
February	36,537	....	120,549	....
Total, 12 months	537,670	....	1,620,977	....

mately 25 miles pumping stations are located. Besides the two or more large tanks for holding the crude discharged from the line is a powerhouse in which are located the great pumps for forcing the oil through the line, auxiliary pumps for various purposes, as well as steam boilers in which to generate steam for operating the plant. The triplex double-acting pump is the type quite generally used. These are supplied with a liberal number of valves, which condition together with the action of the three pistons results in forcing forward a nearly constant stream. At the next station the crude is received in one of the large tanks from which it is again pumped forward. In 1907 the rifled pipe was introduced in California for the purpose of handling the heavy viscous crudes. The rifling is about one-eighth inch in depth and makes one complete revolution in every 10 linear feet. In operation water is pumped into the line at the same time as the oil, and it follows the pipe itself, acting as a lubricant. As an indication of the capacity of these lines, the following statements are interesting: The Gulf Pipe Line Company has an eight-inch trunk line from Watkins Station to Glenn Pool, Sour Lake, a distance of 419 miles. It has a capacity of 14,000 barrels per day. The Texas Company has a trunk line eight inches in diameter from Lefebre Station, Tulsa, to Humble, Tex., the length of which is 470 miles. The delivery capacity of this line is 15,000 barrels daily.

The statistics given in the preceding table taken from a current periodical show the vast quantities of crude petroleum being transported by the principal pipe-line companies.

Production of the United States.— The amount of marketed production in the United States during the last 10 years has suffered no set-back, reaching in 1915 a total of 281,104,104 barrels, valued at $179,462,890. Of this quantity 83.49 per cent was produced in the newer fields west of the Mississippi. The actual gallonage in the Eastern fields is somewhat smaller than formerly but the great change in percentage of yield between the sections is due to the enormously increased production in the West. The following table shows the production of crude petroleum and the value by years since the beginning in 1859 to 1917 inclusive:

QUANTITY AND VALUE OF PRODUCTION OF CRUDE PETROLEUM, 1859–1917.

YEAR	Barrels, 42 gallons	Total value
1859	2,000	$32,000
1860	500,000	4,800,000
1861	2,113,609	1,035,668
1862	3,056,690	3,209,525
1863	2,611,309	8,225,663
1864	2,116,109	20,896,576
1865	2,497,700	16,459,853
1866	3,597,700	13,455,398
1867	3,347,300	8,066,993
1868	3,646,117	13,217,174
1869	4,215,000	23,730,450
1870	5,260,745	20,503,754
1871	5,205,234	22,591,180
1872	6,293,194	21,440,503
1873	9,893,786	18,100,464
1874	10,926,945	12,647,527
1875	8,787,514	7,368,133
1876	9,132,669	22,982,822
1877	13,350,363	31,788,566
1878	15,396,868	18,044,520
1879	19,914,146	17,210,708
1880	26,286,123	24,600,638
1881	27,661,238	25,448,339
1882	30,349,897	$23,631,165
1883	23,449,633	25,790,252
1884	24,218,438	20,595,966
1885	21,858,785	19,198,243
1886	28,064,841	19,996,313
1887	28,283,483	18,877,094
1888	27,612,025	17,947,620
1889	35,163,513	26,963,340
1890	45,823,517	35,365,105
1891	54,292,655	30,526,553
1892	50,514,657	25,906,463
1893	48,431,066	28,950,326
1894	49,344,516	35,522,095
1895	52,892,276	57,632,296
1896	60,960,361	58,518,709
1897	60,475,516	40,874,072
1898	55,364,233	44,193,359
1899	57,070,850	64,603,904
1900	63,620,529	75,989,313
1901	69,389,194	66,417,335
1902	88,766,916	71,178,910
1903	100,461,337	94,694,050
1904	117,080,960	101,175,455
1905	134,717,580	84,157,399
1906	126,493,936	92,444,735
1907	166,095,335	120,106,749
1908	178,527,355	129,079,184
1909	183,170,874	128,328,487
1910	209,557,248	127,899,688
1911	220,449,391	134,044,752
1912	222,935,044	164,213,247
1913	248,446,230	237,121,388
1914	265,762,535	214,125,215
1915	281,104,104	179,462,890
1916	300,767,158	330,899,868
1917	335,315,601	522,635,213

The following table gives the quantity of crude petroleum produced by each State for the years 1914, 1915 and 1916:

STATE	Years	Quantity (bbls.)	Percentage	Rank
California	1914	99,775,327	37.54	1
	1915	86,591,535	30.81	2
	1916	90,951,936	30.24	2
Oklahoma	1914	73,631,724	27.71	2
	1915	97,915,243	34.83	1
	1916	107,071,715	35.60	1
Illinois	1914	21,919,749	8.25	3
	1915	19,041,695	6.77	4
	1916	17,714,235	5.89	4
Texas	1914	20,068,184	7.55	4
	1915	24,942,701	8.87	3
	1916	27,644,605	9.19	3
Louisiana	1914	14,309,435	5.39	5
	1915	18,191,539	6.47	5
	1916	15,248,138	5.07	5
West Virginia	1914	9,680,033	3.64	6
	1915	9,264,798	3.30	6
	1916	8,731,184	2.90	7
Ohio	1914	8,536,352	3.21	6
	1915	7,825,326	2.78	8
	1916	7,744,511	2.57	8
Pennsylvania	1914	8,170,335	3.07	7
	1915	7,838,705	2.79	7
	1916	7,592,394	2.52	9
Wyoming	1914	3,560,375	1.34	8
	1915	4,245,525	1.51	9
	1916	6,234,137	2.07	10
Kansas	1914	3,103,585	1.17	9
	1915	2,823,487	1.00	10
Indiana	1914	1,335,456	.50	10
	1915	875,758	.31	12
	1916	769,036	.26	13
New York	1914	938,974	.35	11
	1915	887,778	.32	11
	1916	874,087	.29	12
Kentucky	1914	502,441	.19	12
	1915	437,274	.16	13
	1916	1,203,246	.40	11
Colorado	1914	222,773	.09	13
	1915	208,475	.08	14
	1916	197,235	.07	14
Alaska	1914	7,792	......	16
Michigan	1915	14,265	......	18
Missouri	1916	7,705	.02	17
Montana	1916	44,917	......	15
Total	1914	265,762,535	100.00	
	1915	281,104,104	100.00	
	1916	300,767,158	100.00	

World's Production of Crude Petroleum in 1916 and Since 1857, by Countries.

COUNTRY	Production, 1916			Total production, 1857–1916		
	Barrels of 42 gallons	Metric tons	Percentage of total	Barrels of 42 gallons	Metric tons	Percentage of total
United States [a]	300,767,158	40,102,288	65.26	[a]3,917,328,402	[a]522,310,554	60.46
Russia	[b]72,801,110	9,933,387	15.80	1,763,583,017	232,917,643	27.22
Mexico	39,817,402	5,308,987	8.64	163,087,779	21,728,995	2.52
Dutch East Indies [c]	13,174,399	1,820,247	2.86	162,174,312	21,849,705	2.50
Rumania	[b]10,298,208	1,432,296	2.23	140,310,595	18,910,174	2.16
India	8,491,137	1,132,152	1.84	90,083,522	12,011,136	1.39
Galicia	6,461,706	898,670	1.40	142,494,206	19,817,034	2.20
Japan and Formosa	2,997,178	399,624	.65	33,166,800	4,422,230	.51
Peru	2,550,645	340,086	.55	19,344,868	2,579,315	.30
Trinidad	[d]1,000,000	139,082	.22	3,819,430	531,214	.06
Germany	995,764	[d]40,000	.22	14,957,097	2,015,974	.23
Argentina	870,000	116,000	.19	1,903,121	267,693	.03
Egypt	411,000	54,800	.09	1,759,936	234,658	.03
Canada	198,123	26,416	.04	23,907,197	3,187,626	.37
Italy	43,143	[d]6,000	.01	889,513	125,884	.02
Other countries	[d]25,000	3,333		397,000	52,953	.02
Totals	460,901,973	61,853,368	100.00	6,479,206,795	862,962,768	100.00

[a] Marketed production. [b] Estimated in part. [c] Includes British Borneo. [d] Estimated.

Distillation and Refining.— The separation of petroleum into its various usable components is based upon the principle of fractional distillation. This is carried so far as to result in the actual decomposition of some of the constituent hydrocarbons when running crude specially for the production of gasoline and illuminating oil. In the early days of the distillation of crude petroleum the main purpose was to make illuminating oils. At that period the gasolines were worse than useless and when the stocks had accumulated to the capacity of storage, not infrequently the water-cock in the bottom of the tank would be «accidentally» left open and the naphtha, as it was then called, allowed to flow out until the tank was empty. Many disastrous fires resulted in the oil region from this practice.

Destructive or Cracking Process.— The stills utilized in distilling for illuminating oils by the destructive process are usually horizontal cylinders mounted in brickwork, much the same as steam boilers, except that the upper half of the still is left uncovered. Heat is applied by burning coal in a furnace the same as under boilers. From the top of the still a large vapor pipe, or pipes, lead to coils of pipe submerged in water held in large, shallow iron tanks called condensers; these coils end in a pipe leading to the running-room where it terminates in a boiler iron «look-box» fitted with plate-glass for purposes of observation. Leading from this «look-box» is a pipe with side outlets connecting with various tanks.

After charging the still with crude petroleum the fires are started and the lighter products known as the naphthas pass over through the vapor pipes and condenser into the running-house. Samples are taken from the «look-boxes» and weighed and when the degree Baumé is heavy enough to indicate that all the naphtha is off, the stream of distillate is conducted into another tank and allowed to run until the next lower «cut» is indicated by the Baumé degree of the sample. In this way, roughly, the naphthas of various grades and the illuminating oils are taken off. The heavier residual oil is usually then transferred to another still — «tar still» — in which distillation is similarly conducted until nothing but coke remains. The heavier distillates, as the process proceeds, do not easily pass out through the vapor pipe but condense on the cooler upper surface of the still and finally fall back in drops into the hotter oil below. This results in the decomposition or «cracking» of the original hydrocarbon and the formation of additional quantities of illuminating oil distillates. When necessary the fires are increased until all of the oil has been decomposed and the carbon which was set free by the operation has collected as coke, which must be removed by picks. Formerly this coke was largely used in the production of carbons for arc lamps used in street lighting. One of its uses at present is in dry cells employed for battery ignition in motor cars.

The heavy distillates from the second stage of this process are treated with sulphuric acid in a lead-lined agitator, followed by a soda solution, and finally washed with water, are chilled and pressed for paraffin wax, which is subjected to various treatments, and is finally marketed as a white refined scale wax. The distillates from which the waxes have been removed are used in making the pale and red paraffin oils for lubricating purposes.

The naphthas from this process are treated with sulphuric acid, washed and neutralized with caustic soda and redistilled for separation into the various grades of gasoline. From Pennsylvanian petroleum 88° Baumé gasoline is separated for use in carburetting air in gas machines to be used both for domestic heating and lighting. Following this is cut a grade known as 76° Baumé gasoline and then follow the heavier grades used as fuel for automobiles and other internal combustion engines. Because of the great demand for the latter purposes very small amounts of the higher grades are now separated. This demand has also resulted in a multiplication of «cracking processes,» so that stills or other devices in which some of the high-boiling residuals may be cracked and recombined under pressure are now being erected in large numbers.

Burton Process.— One of them is the Burton process which has been developed commercially to such an extent that the production of "motor spirits" by this method alone was stated in April 1916 to amount to over 3,000,000 barrels per year. The apparatus used by Burton consists of a still mounted over a furnace and equipped with a safety-valve, pressure gauge and thermometer. A pipe leads from the top of the still to the usual condenser, consisting of a pipe-coil immersed in the usual cooling tank. From near the lower end of this coil, a small pipe leads up to a relief valve, and lower, connected to a receiver for the condensates, is a shut-off valve. This valve is normally closed. The relief valve allows any excess gas pressure to escape. The pressure with the shut-off valve closed runs up to four or five atmospheres, raising the boiling point from 500° F. to 750° F. or 800° F. After charging a Burton still with the special cut of distillate oil that has been found to yield the most satisfactory products, the fires are started and distillation begins. Similarly to the way steam pressure is built up by the evaporation or distillation of water in a steam boiler, so the oil vapors build up the pressure in the still, condenser and receiver, oil and vapor — two phase system — being under the same pressure. The heavier distillates are "cracked" under this treatment and recombined to form good yields of gasoline, the residual being purified and utilized as a lubricant. The shut-off valve is opened at intervals to allow withdrawal of the gasoline formed. As stated, in this process both vapor and liquid are subjected to the same pressure, differing in this respect from the Rittman process in which the vapor only — one phase system — is under pressure. Another difference is that the Burton process is operated chiefly for the production of gasoline, while the Rittman process can be operated either to produce gasoline or the aromatic hydrocarbons, benzol, toluol and xylol.

Rittman Process.— In the process of Walter F. Rittman, vaporized petroleum is passed into a hot tube at 840° F., the pressure in the tube being held variously from 90 to 500 pounds per square inch, adjusted for the product desired. The cracked vapors are condensed under pressure and the condensate transferred to a still where it is distilled for its gasoline content. It is claimed for this process that by cracking the oil in the form of vapor any combination of temperature and pressure may be applied; and any oil from kerosene to much heavier fractions may be used. It is interesting that Rittman concludes as the result of experiments that the formation of aromatic hydrocarbons (benzol, toluol, etc.) occurs best at moderate to high temperatures and under high pressure. The formation of gasoline is favored by moderate to low temperatures and by high pressure.

McAfee Process.— For the increased production of gasoline, this is an interesting method depending on the reactive or catalyzing power of aluminum chloride and proper temperature control. There is no need of employing extra pressure, or vacuum or special apparatus; any still with a stirrer in it suffices. The operation is so controlled that the vapor is kept at a temperature not to exceed 356° F. The distillate obtained will be a mixture of gasoline, solvent oil and kerosene which is afterward separated by fractional distillation. These products are all water-white, sweet-smelling, saturated and need no refining with sulphuric acid. In practice no treatment is given them except a washing with alkali followed with water to remove hydrogen sulphide. With proper back-trapping of high-boiling oils into the still from the air-cooled condenser of 320° F. in the vapor line, the distillate obtained will be gasoline alone which is ready for the market when washed with an alkaline solution.

Fractional Distillation.— The other method of distilling crude petroleum is by fractional distillation throughout the process and with the least possible cracking or decomposition. Stills for this purpose are horizontal cylindrical tanks from approximately 30 to 40 feet in length by 10 to 12 feet in diameter, some of them holding as much as 1,000 barrels. These stills are mounted similarly to those for destructive distillation except that the tops are bricked over and insulated, with even greater care than with steam boilers, to prevent any possible condensation within the still. They are also supplied internally with perforated iron pipes at the bottom to allow the admission of steam to keep the oil in agitation during distillation, as well as to assist in carrying over the oil vapors as fast as formed. These stills are fitted with vapor pipes, condensers, look-boxes, etc., much the same as the stills for destructive distillation above described.

During the early part of the process the naphthas and burning oils come off practically the same as in the cracking process. Below the fraction from which the kerosene can be made is a heavier distillate utilized in making a burning oil of 300° F., fire test, which is used in signal oils required for lighting on steamboats or other means of transporting passengers where electricity is not available. Then follow heavier distillates containing the paraffin wax. The residual is a heavy viscous oil which may be used just as produced for the lubrication of the cylinders of steam engines or may be first filtered through filtering clay to decolorize it and brought on the market as a transparent oil. From this filtered cylinder stock petrolatum is also manufactured.

The wax distillate is chilled and pressed for the removal of the paraffin wax. The wax is submitted to various operations, being washed with sulphuric acid to decolorize and sweeten it by dissolving out unsaturated bodies that bear both color and odor; by being neutralized with a soda solution which also dissolves out bodies not removed by the acid, by being washed with water to remove all traces of chemical treatment; and finally filtered and put on the market as refined wax of different melting points. One grade has become an important article of domestic consumption because of its adaptability as a "cover" for jelly jars. The wax is chemically pure and heating for the purpose of melting so sterilizes it that jelly covered with the melted wax always "keeps." The wax-free distillate is fractioned by further distillation into various grades which are given the added preparation needed for each special service and the whole series from this process brought to the market as "neutral oils." While all petroleums are practically neutral in reaction, the term "neutral oil" has always been applied to the lighter colored distillate oils made by the process of "fractional distillation."

One of the most notable variations of the process of fractional distillation is the use of diminished pressure by means of which the distillation proceeds at lower temperatures and reduces possible cracking to the minimum. The inventor of the vacuum process, patented in 1866, expected to convert the entire body of the crude petroleum into illuminating oil, the hope of all refiners at that period. However, though the results obtained in working this patent were disappointing, they did furnish products of such excellence that they became the foundation of what has grown to be the largest industry of its kind in the world. They were the first unburned residual oils offered for sale and were sold direct to consumers, a policy always followed. The Gargoyle Brands, or, as they were earlier known, the Vacuum Brands, of lubricating oils, have literally carried the name of the Vacuum Oil Company of Rochester, N. Y., around the world.

Wells Process.— Another modification for fractional distillation was patented by Willet C. and Frank E. Wells, in 1908. The essential apparatus consists of a separating vessel to contain the petroleum to be refined and fractionated; a condenser in which to cool the distilled fractions; receiving tanks for holding the condensates; a pump for circulating gas, and a steam boiler for generating steam with which to heat the petroleum, there being no furnace under the separating vessel. The heating coil in the latter has an upper and a lower connection with the steam boiler, both above the water level to ensure circulation. Instead of the usual blowing of steam into the petroleum to assist in the distillation, the Wells process is based on the theory that a permanent gas pre-heated to a definite temperature injected into the petroleum heated to a corresponding temperature will absorb fractions having boiling points corresponding to these temperatures. By raising the temperature of the petroleum as well as the gas all of the desired fractions can be successively distilled, leaving the heavy residual in the separating vessel. The gas laden with the distillates from the petroleum is conducted through the condenser and thence to the receiving tanks. Here the separation is completed, the condensed fraction remaining in the tank, the gas being exhausted by means of the pump and returned to the separating vessel through heated pipes, to again perform its function of extracting fractions of consecutively higher boiling points. If it be desirable to decolorize any fraction, this is done by passing it, while still dissolved in the gas, through filters charged with fullers earth.

In no other country has the manufacture of lubricating oils reached such a high degree of excellence as in the United States. No other crude affords such a wide range of lubricating oils as the paraffin base oil from the Appalachian field. These facts are substantiated by the practically exclusive use in this country of mineral lubricating oils of domestic manufacture for all purposes, and by the greater and constantly increasing quantities exported.

Export.— For many years the production of crude oil was in excess of the home demand and over one-half of the entire yield had been compelled to seek a market in foreign lands. This condition has changed considerably as shown by the figures available for 1915. During that year there was produced in the United States 11,806,372,368 gallons of crude petroleum of which only 158,263,069 gallons were exported. Prior to the development of the Russian oil industry on the Caspian Sea, on a large scale, American refined oil held almost undisputed sway in the markets of the world. Latterly the Java petroleum has become an active competitor.

Nearly all the oil shipped abroad is transported in bulk in tank steamers specially constructed for the purpose. Beginning about 1900 large fleets of these vessels have come into existence, and the ocean carrying trade of oil in bulk has assumed vast proportions. These vessels are built of steel and many of them use oil for fuel to furnish their steam power. The largest motor-driven ship built in America to date is equipped with three Bolinder internal combustion engines and is owned and used exclusively by the Vacuum Oil Company for the transportation of petroleum and its products. While sailing vessels are sometimes used for cargoes of lubricating oils in barrels, their employment for this purpose has nearly ceased. By the old method, the sailing vessel carrying from 5,000 to 8,000 barrels of oil would make but three or four trips a year. The modern type of tank steamer has been increasing in size from the 6,000 to 10,000 tons carrying capacity, capable of making 8 to 10 trips per year, to the tanker *Standard* which holds enough oil to fill 108,000 barrels of the customary 50-gallon size.

The first of the very large tankers for export shipments was the *Narragansett*, completed for the Anglo-American Oil Company in 1903. She is built of steel, and has a gross tonnage of 9,169 tons.

The oil tanks proper, of which there are eight, are situated four forward and four aft of the machinery space and are divided by a longitudinal bulkhead running fore and aft through all the tanks.

The steamship *Paulsboro*, completed for the Vacuum Oil Company in September 1916, is a typical vessel of the modern tanker type; built of steel — 435 feet long, 56 feet beam, depth of 33 feet 6 inches. She has a capacity for 11,529 tons of cargo, the equivalent of 78,835 42-gallon barrels. Besides this, she has a capacity for fuel oil, for the use of her boilers, of 1,708 barrels. She has 8 main oil tanks besides 10 wing or summer tanks and 2 fuel tanks. She is propelled by triple expansion engines and has a speed of 12½ knots under fully loaded condition in good weather. She is equipped with two National Transit cargo pumps size 18" x 14" x 24". Pipe-lines are 12-inch.

The record of petroleum and its products exported since 1862, together with its value, is as follows, as reported by the United States Bureau of Statistics:

PETROLEUM EXPORTS AND VALUE FOR YEARS 1862 to 1916.

YEAR	Gallons	Value
1862	2,664,280	$1,598,568
1863	4,680,174	2,340,087
1864	23,210,369	10,782,689
1865	25,496,849	16,563,413
1866	50,987,341	24,830,887
1867	70,255,481	24,407,642
1868	79,456,888	21,810,676
1869	100,636,684	31,127,433

YEAR	Gallons	Value
1870	113,735,294	$32,668,960
1871	152,195,617	36,663,825
1872	144,318,707	33,761,685
1873	240,369,908	45,924,880
1874	235,108,168	33,042,276
1875	237,526,312	31,734,861
1876	263,449,455	49,545,219
1877	361,883,225	57,539,873
1878	349,346,253	41,022,007
1879	421,719,782	37,235,467
1880	346,779,443	34,505,645
1881	514,561,719	48,556,103
1882	503,492,462	44,623,074
1883	533,145,429	47,763,079
1884	544,495,608	49,457,116
1885	560,784,459	49,671,743
1886	591,884,302	48,145,204
1887	601,846,317	46,898,842
1888	572,457,975	48,105,703
1889	680,705,456	53,293,299
1890	693,829,848	52,270,953
1891	673,905,577	46,174,835
1892	744,638,463	42,729,157
1893	804,221,230	42,142,058
1894	908,252,314	41,499,806
1895	884,502,082	46,660,082
1896	890,458,994	62,383,403
1897	994,297,757	59,057,547
1898	986,480,610	52,551,048
1899	951,024,441	64,982,249
1900	975,123,476	73,276,282
1901	1,079,074,519	72,784,912
1902	1,064,233,601	68,597,143
1903	936,697,255	72,628,539
1904	1,022,116,276	80,624,207
1905	1,220,513,587	79,640,929
1906	1,269,777,645	85,738,866
1907	1,294,659,979	91,383,064
1908	1,547,402,601	108,815,455
1909	1,569,103,378	103,838,590
1910	1,502,491,933	94,107,022
1911	1,768,731,699	105,922,848
1912	1,883,479,897	124,210,382
1913	2,136,465,721	149,316,409
1914	2,240,033,652	139,900,587
1915	2,328,725,749	142,941,669
1916	2,607,482,366	201,721,291
Total	43,244,922,607	$3,309,510,589

This table includes all crude as well as manufactured oils shipped abroad during the past 55 years.

The following table gives the annual exports of illuminating oils only from July 1863 to 30 June 1916:

YEAR ENDING JUNE 30	Gallons	YEAR ENDING JUNE 30	Gallons
1864	12,791,518	1891	571,119,805
1865	12,722,005	1892	564,896,658
1866	34,255,921	1893	642,239,816
1867	62,686,657	1894	730,368,626
1868	67,909,961	1895	714,859,144
1869	84,403,492	1896	697,346,150
1870	97,902,505	1897	761,367,900
1871	132,608,955	1898	806,096,250
1872	122,539,575	1899	713,353,600
1873	158,102,414	1900	710,002,700
1874	217,220,504	1901	769,487,250
1875	191,551,933	1902	842,829,070
1876	204,814,673	1903	699,807,201
1877	262,441,844	1904	741,567,086
1878	289,214,541	1905	881,450,388
1879	331,586,442	1906	878,274,104
1880	367,325,823	1907	905,924,296
1881	332,283,045	1908	1,129,004,833
1882	488,213,033	1909	1,046,401,072
1883	419,821,081	1910	940,247,039
1884	415,615,693	1911	1,112,295,006
1885	458,243,192	1912	1,026,138,239
1886	469,471,451	1913	1,119,441,243
1887	480,845,811	1914	1,010,449,253
1888	456,487,221	1915	836,958,665
1889	502,257,455	1916	854,688,404
1890	523,295,090		

As stated, the manufacture of lubricating oil in the United States has reached a high degree of perfection. The recognition of this fact abroad is attested by the record of our exports of lubricating (heavy paraffin, etc.) oils with their values since 1887 given below:

YEAR	Gallons	Value
1887	20,582,613	$3,559,280
1888	24,510,437	4,215,449
1889	27,903,267	4,638,724
1890	32,090,537	4,766,850
1891	33,310,264	4,099,978
1892	34,026,855	5,130,643
1893	32,432,857	4,738,892
1894	40,190,577	5,449,000
1895	43,418,942	5,867,477
1896	50,525,530	6,556,775
1897	51,228,284	6,478,479
1898	63,968,341	7,385,054
1899	69,329,188	8,344,735
1900	68,997,715	9,542,618
1901	75,305,938	10,260,125
1902	82,200,503	10,872,154
1903	95,621,941	12,690,065
1904	89,688,123	12,393,382
1905	113,730,205	14,312,383
1906	151,268,522	18,689,622
1907	152,028,855	19,210,353
1908	147,769,024	18,971,436
1909	161,639,609	20,016,107
1910	163,832,544	20,921,103
1911	183,319,645	23,337,126
1912	216,393,206	28,297,467
1913	207,639,092	29,608,549
1914	191,647,570	26,316,313
1915	239,678,725	32,459,641
1916	260,805,939	43,027,371
Total	3,125,084,848	$423,057,151

Petroleum as Fuel.— With the largely increased supply of crude oil in 1913, its use as a fuel oil was considerably extended, particularly in the West and Southwest section of this country where the difficulty of obtaining coal as fuel has been greatest. Both locomotives and steamboats have been fitted for burning fuel oil. This is in some cases the crude itself, in others the residual after taking off the kerosene and lighter products — and in still others, the distillates too light for lubrication and too heavy for illuminating oils. The American merchant ships especially in the Pacific, depend almost entirely on petroleum as a fuel, and its popularity in the Atlantic coastwise trade is making its use general there. However, in the States near the great bituminous coal mines where the solid fuel is obtained at relatively lower prices, oil is more expensive to burn for the generation of steam power than coal, though there are many uses to which the liquid fuel is adapted where it would not be possible to use coal. One-half the tonnage of the ocean-going steamers now being built in America are constructed with tanks for oil for fuel, an indication of the line of future development of American trade.

Some figures were published early in 1917 as to the needs of the United States navy for fuel oil, including 1923. For 1917 it was expected that 1,475,000 barrels would be required and this quantity necessarily increased from year to year, so that in 1923 the volume to be provided would amount to 6,721,000 barrels. To take care of this supply the government has set aside certain claims in the West; some of it is proven territory which, it is believed, will take care of the needs of the navy. One of these fields is known as Reserve No. 2 and probably contains above 400,000,000 barrels of oil.

Complete statistics of the consumption of petroleum as fuel in the United States are not available. Data compiled from reports by pipeline companies show 48,868,000 barrels of domestic crude petroleum were delivered for fuel purposes in 1915. In addition more than 16,000,000 barrels of crude oil, much of which was used as fuel, were imported from Mexico; and indeterminate quantities of refinery products of domestic oil found the same use. In the oil fields of the United States, no less than 3,191,000 barrels of crude oil, not recorded anywhere, were consumed in drilling and pumping.

During 1916, 85 railroads, operating in 21 States and Territories, used fuel oil in whole or in part. The following table shows consumption for several years:

STATISTICS OF OIL-BURNING RAILROADS.

YEAR	Fuel oil consumed, barrels	Length of line operated by use of fuel oil, miles	Total mileage made by oil-burning engines, miles	Average No. miles per bbl. oil consumed, miles
1906.....	15,577,655	....	....	....
1907.....	18,849,803	13,573	74,079,726	3.93
1908.....	16,870,882	15,474	64,279,509	3.81
1909......	19,905,335	17,676	72,918,118	3.66
1910.....	23,817,346	22,709	89,107,883	3.74
1911......	29,748,845	30,039	109,680,976	3.69
1912......	33,605,598	28,451	121,393,228	3.61
1913.....	33,004,815	29,145	118,672,162	3.60
1914.....	31,093,266	29,595	118,737,469	3.82
1915.....	36,648,466	30,776	125,255,525	3.39
1916......	42,126,417	31,980	140,434,566	3.33

The following table shows the relative evaporative values of various coals in comparison with petroleum. In addition, however, the labor item enters in deciding which is the more economical steam producer for the individual plant.

ONE POUND OF COMBUSTIBLE	Pounds of water evaporated at 212° F. per pound of combustible	Barrels of petroleum required to do the same amount of evaporation as tons of coal	Cost of coal per ton to equal petroleum at $1 per barrel	Less 10 per cent, owing to the greater economy in handling petroleum
Petroleum, 18° to 40°..........................	16.0	....	......	....
Pittsburgh lump and nut, Pennsylvania........	10.3	4.1	$4.10	$3.69
Pittsburgh nut and slack, Pennsylvania........	8.0	3.2	3.20	2.88
Anthracite, Pennsylvania....................	9.8	3.9	3.90	3.51
Indiana block................................	9.5	3.8	3.80	3.42
Georges Creek lump, Maryland...............	10.0	4.0	4.00	3.60
New River, West Virginia....................	9.7	3.8	3.80	3.42
Pocahontas lump, Virginia....................	10.5	4.2	4.20	3.78
Cardiff lump, Wales..........................	10.0	4.0	4.00	3.60
Cape Breton, Canada........................	9.2	3.7	3.70	3.33
Nanaimo, British Columbia..................	7.3	2.9	2.90	2.61
Co-operative, British Columbia..............	8.9	3.6	3.60	3.24
Greta, Washington...........................	7.6	3.0	3.00	2.70
Carbon Hill, Washington.....................	7.6	3.0	3.00	2.70

One pound petroleum = 16 pounds of water evaporated from and at 212° F.
One pound coal = 10 pounds of water evaporated from and at 212° F.
One pound petroleum = 1.6 pounds good coal.
$\frac{(2{,}000)}{16}$ = 1,250 pounds petroleum = 2,000 pounds coal.
312 pounds petroleum = 1 barrel of petroleum.
$\frac{(1{,}250)}{312}$ = 4 barrels petroleum = 2,000 pounds coal.

As these figures are based on equivalent weights, it follows that the fuel oils of low degree Baumé or high specific gravity offer advantages both as to heat units per barrel and as to storage capacity required.

FLORUS R. BAXTER,
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PETROLEUM POISONING. Not a few instances of poisoning by petroleum have been recorded in medical annals, and numerous experiments have been performed upon animals in the endeavor to determine the character of its effects. These experiments have seemed to prove that the deleterious effects noted have been caused only by the heavy oils and the residuum after distillation, the light oils being entirely harmless. The chief symptoms recorded were an irritation and inflammation of the stomach with a few lacerations and blood clots on the lining membrane of the stomach and intestines in extreme cases. On the other hand the widespread use of refined heavy oil by multitudes of persons for the relief of sluggish action of the bowels indicates that except in large quantities the poisoning effects do not supervene. In excessive doses petroleum has been known to cause faintness with vertigo, headache and palpitation of the heart.

PETROLIA, Canada, town of Lambton County, Ontario, on the Michigan Central and the Grand Trunk railroads, 20 miles southeast of Port Huron. It is an important oil-producing centre, has numerous oil wells, refineries, etc., and manufactures of oil-well machinery, boilers, automobiles, wagons, machine-shop products, bricks, etc. It has also a hospital, public library, two parks and a business college. Pop. 3,518.

PETROLOGY, that branch of geology that treats of the origin, composition, texture, classification and occurrence of rocks. Petrography is narrower, dealing only with composition, texture and classification, largely as revealed by the petrographic microscope. Lithology has been used as a synonym for petrology, but is coming to be applied to a study of rocks without the microscope, but otherwise in the more restricted sense of petrography. See OPTICAL MINERALOGY; ROCKS AND GEOLOGY.

PETRONIUS, pe-trō'nĭ-ŭs, **Arbiter,** Roman author, identified as the man of unsavory reputation, known to be the favorite of Nero, at whose court he was ***arbiter elegantiarum.*** The influence thus gained by Petronius made him an object of dislike to the all-powerful Tigellinus. Accused of treason, he forestalled what he thought inevitable death by an eccentric suicide, opening his veins, but prolonging life for some time by the application of bandages (66 A.D.). Such is a brief résumé of the account by Tacitus in the 'Annales.' To this Petronius is generally assigned the book known as 'Satira' or 'Satiricon,' an incomplete work of picaresque fiction in prose and verse, published in Paris in 1601 and in Amsterdam in 1663. The longest portion is the 'Banquet of Trimalchio' ('Cena Trimalchionis'), a satirical account of a dinner given by Trimalchio, a good-humored freedman and *nouveau riche*. The work is of interest from the fact that in the speech of many of the characters is preserved the *sermo plebeius*, or dialect of the lower classes, of which little remains. The best text is that of Bücheler (1862; smaller ed., 1895). There is an edition of the 'Cena,' with commentary, by Waters (1901); and an English translation of it, with introduction by Harry Thurston Peck (New York 1898). Consult also Collignon, A., 'Etude sur Petrone' (Paris 1892); Whibley, C., 'Studies in Frankness' (New York 1912).

PETROPOLIS, pāt-rō′pō-lēs, Brazil, city of the state of Rio de Janeiro, 30 miles by rail from the city of that name. Virtually a health resort, it lies in the Serra d'Estrella, was built in 1845 and settled by a German colony who named it in honor of Dom Pedro. It is a thriving and picturesque mountain city, with broad, clean streets, down some of which run little brooks. The buildings are of tasteful architecture, and hotels and sanitariums abound. The city is connected with Rio de Janeiro by two railway lines, and it is the favorite summer resort for the government officials and diplomats of the capital and for the élite of the entire country. Several attempts have been made to have Petropolis declared the capital of its state, but that distinction is firmly held by its commercial rival. Nichtheroy, on the coast. The city has varied manufactures and a population estimated at about 12,000.

PETROTOME. The petrotome is a machine for cutting sections of rocks or fossils and is used both by mineralogists and biologists. Its essential feature is a circular saw of some rather soft metal, like tin, without any teeth, but with the edge impregnated with diamond dust. The saw is run at such a tremendous speed that the centrifugal force keeps it rigid. A stream of cold water keeps the saw and the object from becoming too hot. In botany, it is used for cutting sections of petrified plants. Many fossils are mere impressions, or «casts,» which show only the form without internal structure; but some, designated as petrifactions, show both external form and internal structure. The method of cutting thin sections of petrifactions is the same as for cutting granite or any other hard rock.

Let us suppose that a transverse section of a petrified stem a couple of inches in diameter is to be cut. First the stem is fastened in a rigid clamp and a piece is sawed off so as to leave a fairly smooth surface. This surface is then polished by holding it on a revolving disc covered with polishing powder and water. The polished surface is now cemented to a glass slide. Dry white shellac, heated until it melts, is a good cement. The polished surface is pressed firmly into the cement. When it has become cool the object is again fastened in the clamp and sawed off as close as possible to the glass slide. The section firmly cemented to the slide is now ground thinner and polished on the revolving disc until it is thin enough for microscopic observation. Any powder and dirt is carefully washed away. When the slide is perfectly dry a few drops of Canada balsam and a thin cover glass are added, and the mount is ready for use. Not only cell walls, but even the nuclei and other cell contents are easily shown in sections cut from Paleozoic rocks. Consult Chamberlain, C. J., 'Methods in Plant Histology'; Wieland, G. R., 'American Fossil Cycads' (Vol. I).

CHARLES J. CHAMBERLAIN.

PETRUCCI, pā-troo′chē, **Ottaviano dè** («PETRUTIUS FOROSEMPRONENSIS»), Italian printer: b. Fossombrone, near Urbino, Italy, 1466; d. 1539. He invented the art of printing music by means of movable types, each note being cast complete with a staff line. He established himself in Venice in 1491, and in 1498 was granted sole right to the use of his discovery for 20 years by the council of Venice. From 1498–1511 he prospered, but then attempted further experiments which proved so expensive that he was forced to sell his rights. He then removed to his native city, and from Pope Leo X secured rights for the papal states for 15 years, but never achieved any considerable success there. His process involved double printing, the staff lines being first laid on and then the notes in their proper position requiring the utmost nicety in execution. The specimens remaining of his work are exceedingly neat and exact and are both rare and valuable. His first work was 'Harmonice Musices Odhecaton A.' It was printed in Venice in 1501. It comprised a collection of 96 pieces arranged for three or four voices by eminent musicians of the time. He was very prolific, his publications following one another in rapid succession. A fine collection of his works is treasured at the British Museum.

PETRUCHIO, pĕ-troo′chō or -ki-ō, in Shakespeare's 'Taming of the Shrew,' a gentleman of Verona, who becomes the husband of Katherine, Baptista's high-tempered daughter, known to her friends and neighbors as «the shrew.» Petruchio treats her with a mad turbulence even exceeding hers, in order «to kill her in her own humor.» Under all his roughness he preserves his own good nature, and in the end the «taming» of Katherine is complete.

PETTENKOFER, pĕt′tĕn-kō-fĕr, **Max Joseph von**, German chemist: b. near Neuburg, 3 Dec. 1818; d. 10 Feb. 1901. He was graduated from the University of Munich with the degree of M.D. in 1843. Following his graduation he was associated with Liebig in his preparation of meat extracts. In 1847 became professor of chemistry there, a post which he held until 1894. He was the earliest in Germany to give practical instruction in hygiene, which he began to do in 1866, and his name has since been associated with advances in that direction. He made many valuable contributions to science on subjects as various as gold-refining, gas-making, the manufacture of glass, ventilation, clothing, the influence of soils on health, epidemics,— his researches in regard to ventilation and cholera being of especial value. He also established the connection of the rise and fall of subsoil water with the prevalence of typhoid. He was the first to demonstrate that cholera is propagated by a germ and that local conditions are largely responsible for the spread of the disease. He published ‘Untersuchungen über die Verbreitungsart der Cholera’ (1885); ‘Ueber den Luftwechsel in Wohngebäuden’ (1858); ‘Populäre Vorträge’; ‘Beziehungen der Luft zu Kleidung, Wohnung und Boden’; ‘Handbuch der Hygiene’ (1882), etc.

PETTIE, pĕt'ĭ, **John,** Scottish genre painter: b. Edinburgh, 17 March 1839: d. Hastings, 21 Feb. 1893. He exhibited for the first time in the Royal Scottish Academy ‘The Prison Pet’ (1859); removed to London in 1862 and was elected associate to the Royal Academy in 1867 and Royal Academician 1875. His work as a historical painter was much admired and his pictures sold well. Of the very large number which he produced only a few of the more prominent ones may be mentioned, ‘Disgrace of Wolsey’ (1869); ‘Juliet and Friar Laurence’ (1874); ‘Flag of Truce’ (1873); ‘Duke of Monmouth before James II’ (1882).

PETTIGREW, pĕt'ĭ-groo, **James Johnston,** American soldier: b. Tyrrell County, N. C., 4 July 1828; d. Bunker Hill, Va., 17 July 1863. He was graduated from the University of North Carolina in 1847, was professor in the Naval Observatory at Washington for a year when he resigned to study law in Charleston, S. C. He was admitted to the bar in 1849. Early in 1850 he went to Germany where he spent about two years in the study of law, and afterward traveled extensively. For a few months he acted as secretary of legation at Madrid, returning in 1852 to Charleston where he practised law with much success. In 1856 he was elected to the legislature, where he vigorously opposed the slave trade. Foreseeing the Civil War he went in 1859 to Italy in order to acquire knowledge of arms in the Sardinian army, but they had been withdrawn from active service. He then returned to South Carolina and engaged in drilling a regiment of riflemen. With this regiment he took possession of Castle Pinkney in December 1860, immediately upon the secession of his State. After the opening of the Civil War he proved himself an able engineer in the construction of batteries and was appointed brigadier-general in the Confederate army in 1862. He defended Richmond against General Stoneman in 1863 and at the battle of Gettysburg led his brigade in Hill's corps against the Iron brigade. He was in command of Heth's division on the third day and participated in the famous charge on Cemetery Ridge. In the retreat which followed the battle he was fatally wounded. His book, ‘Spain and the Spaniards,’ was published in 1861.

PETTIGREW, Richard Franklin, American lawyer and political leader: b. Ludlow, Vt., 23 July 1848. He was educated at Beloit College, Wisconsin, and at the law school of the University of Wisconsin. In 1869 he went to Dakota as surveyor in the United States service, and located at Sioux Falls, where he engaged in surveying and real estate business. It was not until 1872 that the population of that section had increased to the degree that he could enter upon the practice of law. He became prominent also in public life; was a member of the legislative council of Dakota 1877–81; represented the Territory in Congress in 1881–83; was a member of the Constitutional Convention in 1883, and of the Territorial Council in 1884–85. After the admission of South Dakota as a State he was elected to the United States Senate on the Republican ticket, where he served two terms, from 1889 to 1901. In 1896 he left the Republican party on account of its opposition to the free coinage of silver and its attitude toward the trusts, and in the elections of that year and of 1900 supported Bryan for the Presidency. After the Spanish War he led the opposition in the Senate against the annexation of the Philippines and the imperialistic policy. Besides his political activities he took a leading part in civic and industrial enterprises, building the Sioux Falls street railways and the Sioux Falls Terminal Railway, and organizing the Sioux Falls Stock Yards and the Midland Pacific Railroad, extending from Sioux Falls through Wyoming and Idaho to Puget Sound.

PETTUS, Edmund Winston, American legislator: b. Limestone County, Ala., 6 July 1821; d. Selma, Ala., 27 July 1907. Pettus was educated at Clinton College, Tennessee. In 1842 he was admitted to the bar and began the practice of law at Gainesville, Ala. From 1842 to 1855, except for a short time when in California, Pettus was district solicitor. From 1855–58 he was circuit judge. In the Mexican War he served as a lieutenant. When Alabama seceded in 1861 Pettus was sent as commissioner to Mississippi, of which State his brother was governor. He entered the Confederate army as major and rose to be brigadier-general in the Western army. After the war he devoted himself to his profession until 1897 when he was elected to the United States Senate. He was re-elected in 1903 without opposition.

PETTY, pĕt'ĭ, Sir **William,** English political economist: b. Romsey, Hampshire, 26 May 1623; d. London, 16 Dec. 1687. He showed great precocity in carpentry and other mechanical trades, and went to sea in his early teens. Suffering a broken leg on ship board he was left by the sailors on a sparsely settled section of the coast of France, where he devoted himself to teaching until he had acquired funds to enter the Jesuit College at Caēn. He later studied at the universities of Utrecht and Amsterdam and then took a course in medicine at Leyden and at Paris. Returning to England he entered the Royal navy, but during the Civil War lived on the Continent. In 1648 he was instructor in anatomy and chemistry at Oxford; in 1651 filled the chair of anatomy there, at the same time holding a professorship in music at Gresham College, London, and in 1652 he was appointed physician to the army in Ireland, a post in which he achieved renown in his skilful reorganization of the medical service. He was secretary to Henry Cromwell when the latter was lord-lieutenant of Ireland but upon the Restoration soon gained the confidence of Charles II, who appointed him surveyor-general of Ireland and knighted him. He was thus the founder of the Lansdowne family. He was a founder of the Royal Society and one of the leading political economists of the day, receiving the title of “The Father of English Economics.” He published ‘Political Anatomy of Ireland' (1672); 'Observations upon the Cities of London and Rome' (1687); 'Political Arithmetic' (London 1683–89). His 'Economic and Statistical Writings' were gathered and published by Charles H. Hull in 1894; and another edition by the University Press, Cambridge, England, in two volumes in 1899. His history of the survey of Ireland, 'The Down Survey,' was published by the Irish Archæological Society in 1851, at Dublin. Consult Bevan, W. L., 'Sir William Petty' (Baltimore 1894); Carroll, W. G., 'The Lansdowne Irish Estate and Sir William Petty' (Dublin 1881); Fitzmaurice, E. C. P., 'Life of Sir William Petty' (London 1895).

PETTY OFFICER, a rank among the enlisted men of the navy analogous to the non-commissioned officers of the army. Such officers are comparatively more numerous in the navy and receive a higher rate of pay than the army non-commissioned officers. They are also eligible to promotion to warrant rank, and under certain conditions are commissioned as ensigns.

PETTY SESSIONS, Court of. See Court.

PETUNIA, pĕ'tū-ny'ą, one of the most popular of garden flowers on account of its profusion of bloom under almost all conditions of soil and culture. A defect in the habit of the plant is its tendency to sag down on the ground after reaching a modest height, and sprawl about, with, however, many upright flowering branches. This feature is not objectionable where the plants are massed, and in the dwarf varieties, like the little Countess of Ellesmere group, is practically absent. In other uses the plants may be potted and trained to stakes, the pots being sunk in the ground.

From the 16 known natural species the florists have, through hybridizing, obtained remarkably beautiful and rich shades of crimson and rose in which lingers hardly a trace of the objectionable magenta of earlier days. There are also to be found among them magnificent shades of purple, and one group is decorated with a distinct yellow throat. A profusion of blotched, striped, penciled and spotted varieties have been produced, and these are peculiarly effective when massed, as well as interesting individually. Another section has its ample corollas deeply ruffled and fringed, as well as variegated. The *grandiflora* or large-flowered type bears great ruffled flowers five inches or more across, the throats often veined and stained with a characteristic blackish purple. Double varieties, produced in the first instance as sports, have been multiplied by fertilizing the single and semi-double flowers with the pollen of the best doubles. The seed thus obtained will produce from 25 to 40 per cent of fine double-flowering plants, and the remainder of the seedlings are apt to be the choicest of the single blooms. Double petunias of fine form and habit are propagated by cuttings, and thus an endless succession of the best types preserved.

Petunias thrive best in deep rich soil and abundance of sunshine. In the open ground they bloom continuously from June to September. For early flowering the seeds are sown in a hotbed and transplanted into the borders when the weather has become settled warm. They are quite tender and are stunted by low temperatures. The seeds may be sown directly in the open border when the ground has become warm. For winter blooming in pots it is customary to strike cuttings from the bedded plants in early September and bring them along under glass protection.

The wild species are mostly natives of Brazil, Argentina and southern South America, although one is Mexican and one, *P. parviflora,* has become naturalized in the southern States. They are perennial herbs belonging to the order *Solanaceæ,* with opposite leaves and axillary blossoms. The species which have been most used in the production of the modern garden petunias are *P. violacea,* which is probably not now in cultivation as a pure species, and *P. nyctaginaflora,* which may be found in some old gardens. The former has purplish-violet blossoms; the latter, white.

PETZITE, a telluride of silver and gold $(AgAu)_2Te$. Carrying from 18 to 25.6 per cent of gold and 40.7 to 46.8 per cent of silver. An important ore in San Juan and other districts, Colorado, and in several mines in California.

PEUERBACH (PURBACH or PEURBACH), Georg von, Austrian astronomer and mathematician: b. Peurbach, 30 May 1423; d. 8 April 1461. He studied at Vienna and delivered astronomical lectures in the principal cities throughout Europe, later becoming professor of astronomy at the University of Vienna. He prepared a table of sines, which probably were the basis for the modern decimal fraction, but he died before it was done, and his pupil, Regiomontanus, completed it. He was also astronomer to the king of Hungary, and prepared for him a list of planets and the fixed stars. His chief works, published after his death, were 'Theoricæ novæ Planetarum' (1472); 'Tabulæ Ecclipsium' (1514).

PEUTINGER'S (poĭ'ting-ĕrz) **TABLE** (*Tabula Peutingeriana*), a popular name for a Roman chart showing the military roads of the world, drawn, it was formerly believed, for Theodosius the Great in the 3d century. In the original it was in 12 sheets. It is so called after Conrad Peutinger, a German scholar (1465–1547). Among his papers was this famous map, evidently a copy by a monk at Colmar in 1265. Conrad Celtes, who found it in the Benedictine monastery of Tegernsee, borrowed and did not return it. Such a *mappa mundi in rotulo* was extant in that convent in 1502. Celtes bequeathed this map to Peutinger, who intended to publish it, but his death intervened. After his death it disappeared for many years, until Mark Welser published fragments of it. The manuscript of the map is at present in the imperial library at Vienna, where an additional leaf of it was some time ago discovered. The characters and figures show that the map is not the original. Docen thinks that it belongs to the 12th century. Impressions have been published by Mannert (Leipzig 1824), Desjardins (Paris 1869–70) and Miller (Ravensburg 1888), the last on a reduced scale.

PEVERIL OF THE PEAK, a novel by Sir Walter Scott, published in 1823. The time of the story is the reign of Charles II, and the action takes place in the Peak region of Derbyshire and on the Isle of Man. The story is built around Sir Geoffrey Peveril, of the Peak, as the principal character.

PEWEE, a popular name given to several species of American flycatchers of the subfamily *Tyranninæ*, the typical Tyrant-birds or king-birds. The common pewee or Phœbe-bird (*Sayornis fuscus*), is seven inches long and nine and one-half inches in wingspread. The general color is dull olive brown above, darkest on the head and yellowish white below with a brownish hue on the breast; quills brown, most of the wing feathers edged with dull white; tail forked, the outer edge of the lateral feather dull white; bill and feet black. This lively species is found throughout eastern North America, from Newfoundland to Florida, and as far west as eastern Wyoming and Colorado. The pewees winter generally in the Southern States, but some go to Mexico, Central America and the West Indies. In the Middle States it arrives from the south early in April and gets out a first brood by the middle of May; it leaves again for the south in October, migrating by night. Though the pewees mate for life they do not migrate together, the one first returning waiting near the old nest till its mate arrives. The nest resembles that of the barn swallow, being made of mud, grasses and moss, lined with softer materials and attached to a rock, wall or rafter. The rough stone piers of a country-bridge are so often chosen that a widespread name for the bird is «bridge-pewee.» The owners sometimes repair the same nest year after year; the eggs, four to six, are white, with a few reddish spots at the larger end; the young are hatched out on the 13th day, and leave the nest in 16 more; the parents show great affection for them, snapping the bill and darting boldly toward all intruders. The flight of this bird is rapid, with frequent sailings; it is fond of vibrating the tail, erecting the crest and making a tremulous motion with the wings. It feeds on insects, which it takes with great dexterity and rapidity on the wing, swallowing them whole, and, after digestion, ejecting the hard parts. The pewee though offish with human beings is fearless of them, and becomes in a measure sociable upon extended acquaintance.

The wood pewee (*Contopus virens*) is six and one-half inches long and 10¾ in extent of wings, the wings extending beyond the tip of the tail; the general color above is brownish olive; brownish black on the head; two pale grayish bands across the wings; a narrow white circle around the eyes; greenish yellow below, with a grayish tinge on the throat and breast. Its range is about the same as that of the phœbe-bird. It is fond of forests and shady orchards. The flight is swift, with sudden sweeps in pursuit of its insect prey. Its notes are low, mellow and sweetly melancholy when in its favorite haunts; its common name, like that of others of the sub-family, is derived from its utterance of the syllables «pe-wee» or often in three notes, as «pe-a-wee,» plaintively prolonged. The nest of this fly-catcher is a tiny cup of soft materials covered by lichens, and so apparently a part of the branch upon which it sits as to be seen with difficulty; the eggs are four or five, light yellowish, with reddish spots at the larger end; in the Middle States two broods are raised in a season; it boldly attacks man, beast or bird approaching its nest.

Several other dark-colored flycatchers of this group are called «pewee» in various parts of the country, and most of them resemble the examples given above in general habits.

PEWS (Old French, *pui*, from Latin, *podium*, a balcony), enclosed stalls, or, also, open seats in a church devoted to the sole occupancy of a person or family. In the early part of the 14th century worshippers in churches were accustomed to stand or to sit on the floor. A little later they were provided with short three-legged stools. But from 1450 onward mention is found in church records of «pues.» The title of «reading Pue» was given in those days to the elevated stall which held the reading desk. Pews were in use before the Reformation in England and are held by their occupants in the Established Church, by two tenures: first, by prescriptive right, when they descend as an heir-loom; second, all pews not so held are at the disposal of the bishop of the diocese for use and benefit of the parish, and are under him assigned by the church wardens to the parishioners according to their rank. The bishop may grant the right to sit in a particular pew. In the disposal of the pews or seats in the area of parish churches in Scotland parishioners have a preferable claim according to the valued amount of their rent. The disposal of pews or seats in churches of other denominations is a matter of private arrangement. They are commonly rented to defray the congregational expenses. In the United States pews are the property of the church corporation, who can sell or lease them. Whether property in pews is real or personal depends upon the provision made in the statutes of the different States. A purchaser or lessee of a pew may maintain an action at law for trespass or disturbance in the enjoyment of his right. The usual church practice under its rules is to reserve owned and leased pews only for a limited period after the commencement of a regular service. If they are not then occupied by the owner or lessee, they are at the disposal of the ushers for seating other attendants at the service.

PEWTER, a generic term for a variety of alloys, of which tin forms the predominating component. The ordinary pewter is tin alloyed with lead, in the proportion of four parts to one. Specimens of the old Roman pewter left in England at the time of the Roman occupation of that country show a variance in composition ranging from 99 per cent tin to 1 per cent lead, for the richest, to 46 per cent tin and 53 per cent lead, with a little copper. Generally, however, the proportions were either 71.5 per cent tin to 27.8 per cent lead or 78.2 per cent tin to 21.7 per cent lead.

Specimens of early English pewter show a composition of 112 parts tin to 26 parts copper, with no lead, for what is called «fine pewter.» Another formula is 84 parts tin, 7 parts antimony and 4 parts copper. A lower quality has 56 parts tin, 8 parts lead, 6 parts copper and 2 parts zinc. The harder alloys were used for articles subject to the greatest strains in their use, as in bowls and dishes. For mugs and tankards a somewhat softer alloy was prepared; that is one containing more lead in proportion to the tin.

As early as 1348 the guild of pewterers in Great Britain were allowed to make a set of rules by which all pewterers were governed, and these rules were enforced on the trade by law; the intent being to prevent a debasement of the metal by so large a proportion of lead as to render it liable to poison any acid food standing in it.

In the manufacture of pewter three processes were employed. The metal was cast, spun on a lathe, or hammered. Molds were generally of gun metal or brass, and on account of the large expense of making them were passed about from shop to shop, each paying a proportion for their use. The decline of pewter followed upon the cheap production of pottery and china ware on the one hand, and of the activity of the silversmiths on the other. The pewterers for a time imitated the designs of the silversmiths, but the metal was not suited to this work, and lost a large part of its artistic value in consequence.

A revival of interest in pewter had begun by several English societies just before the War broke out in Europe. There is so much of historical and artistic value in the old pewter that it offers a fair field for collectors, and with the return of peace a renewal of the pursuit is to be anticipated.

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PEWTER-MUGGERS, in American history, a popular name given to a New York faction of the Democratic party which was opposed to the Tammany candidates in 1828. Their meetings being held in a Frankfort Street resort, where liquors were served in pewter-mugs the name was affixed by their opponents.

PEYER'S (pī'ėrz) **PATCHES** or **GLANDS** (also called Peyerian Glands), in anatomy, aggregate oval patches on the surface of the mucous membrane lining the bowels, and surrounded by simple follicles, with flattened villi occupying the interspace. They are situated near the lower end of the small intestine (ileum), and their ulceration is the pathognomonic characteristic of enteric or typhoid fever. In health they are indistinct, groups about four inches in length and half an inch across. They were discovered and described in 1677, by Johann Konrad Peyer, a Swiss anatomist.

PEYOTE, pā-yō'tā, a small cactus (*Lophophora williamsii*) abundant in the southwestern United States and northern Mexico, formerly used by all the native redmen of that region as an exhilarant in connection with certain ceremonies, and as a remedy for various ailments; and is still so used among the remaining Indians and Mexicans. The effect is to produce a delightful and apparently non-injurious languor accompanied by a stimulated imagination. Some tribes look upon the plant as of divine origin and treat it with veneration. The name is derived from the Aztec word *peyotl,* and was originally applied to a composite plant of southern Mexico.

PEYTON, pā'tŏn, **Jesse Enlows,** American patriot and promoter: b. Maysville, Ky., 10 Nov. 1815; d. Haddonfield, N. J., 28 April 1897. He first came into prominence in 1843–44 through his secret and successful effort to raise $40,000 to relieve Henry Clay from the seizure of his estate by creditors. He was one of the founders of the Constitutional Union Party in 1860 and was sent by President Lincoln on a mission to Kentucky to dissuade that State from seceding. The first regiment in the Civil War to reach Washington was a cavalry force that Mr. Peyton had raised in New Jersey, and of which he was quartermaster. He also organized two other regiments for the Union army, the 3d and 11th Pennsylvania cavalry. He was instrumental in promoting the centennial of Independence Day (Philadelphia 1876); Bunker Hill Day (1875); Yorktown Day (1881); and of the inauguration of American constitutional government. He was also the prime mover in the World's Columbian Exposition, held at Chicago, Ill., in 1893. At the time of his death he was attempting to organize an international celebration of the birth of Christ, to be held in Jerusalem in 1900. He was the author of 'Reminiscences of Philadelphia during the Past Half Century' (Philadelphia 1888).

PEZET, pā'thāt', **Federico Alfonso,** Peruvian diplomat: b. London, 1859. He received his education in England and at the Lima Military Academy; entered the army, and saw service in the war with Chile, in which he was taken prisoner. In 1884–86 Pezet was Spanish editor of the *Panama Star and Herald,* and in the latter year entered the diplomatic service of his country, becoming consul at Panama. Subsequently he served as consul successively at Liverpool, London and New York. In 1902–09 he was chargé d'affaires and consul general at Panama, was Minister to Panama in 1909, and in 1909–12 was envoy extraordinary to Central America and Panama. Pezet was appointed Peruvian Minister to the United States in 1912. He has published 'Peru: Its Commerce and Resources' (1893); 'The Question of the Pacific' (1901); 'What the Panama Canal Means to Peru' (1911); 'Handbook of Peru for Investors and Immigrants.'

PFÄFERS, pfā'fěrs, or **PFEFFERS,** pfěf'fěrs, Switzerland, a small health-resort in the canton of Saint Gall and 31 miles east of the village of that name. It is famous for its warm baths, situated in the vale of the Tamina, in one of the most extraordinary gorges in Switzerland. Its permanent population is about 600. The baths are built on a narrow ledge of rock a few feet above a rushing mountain torrent, the buildings which form them consisting of two structures connected by a chapel so deeply sunk between the rocks that the sun in the longest summer day is visible above them only from 10 to 4 o'clock. The spring is heavily impregnated with chlorides, and has a temperature of nearly 100° F. Since 1840 the water has been conveyed by pipes to the village of Ragatz (q.v.) below the gorge, a distance of about two and one-half miles, without losing its warmth. Near the village is situated the ancient Benedictine abbey of Pfeffers, a vast edifice, built in 1665, and now used as a lunatic asylum under the name of Saint Pirminsberg. The abbot of this institution in the 10th century enjoyed independence of the civil government of the duchy. Up to 1838 the baths were controlled by the abbey.

PFAFF, pfäf, **Christian Heinrich,** German phyiscian and physicist: b. Stuttgart, 2 March 1772; d. Kiel, Holstein, 24 April 1852. His interest in electricity was first awakened by the celebrated experimenter Gross. He was graduated as a physician at Stuttgart in 1793 and then went to Göttingen, where he published the results of his galvanic inquiries in ‘Ueber thierische Electricität und Reizbarkeit.’ In 1797 he became an extraordinary professor at Kiel and in 1801 was made professor of chemistry, physics and medicine there with rank at the same time as a member of the medical faculty. He then directed his attention particularly to pharmaceutical chemistry, and was thus led to the composition of his most important work, ‘System der Materia Medica nach chemischen Principien’ (1808–24). Among other writings of his are ‘Handbuch der analytischen Chemie’ (1824–25); ‘Ueber und gegen den thierischen Magnetismus’ (1807); ‘Der Electromagnetismus’ (1824); ‘Parallele der chemischen Theorie und der voltaischen Contacttheorie der galvanischen Kette’ (1845).

PFEIFFER, pfīf'ĕr, **Ida Laura Reyer,** Austrian traveler: b. Vienna, 14 Oct. 1797; d. there, 27 Oct. 1858. She received the education usually given a boy and was married in 1820 to Dr. Pfeiffer, a lawyer connected with the Austrian government. Her first long journey was a trip to Palestine and Egypt when she was but five years old. The influence of this experience remained with her, and upon the death of her husband in 1842 she determined to travel. In that year she made a tour which included the Holy Land, Constantinople, Cairo, Arabia and the Red Sea, the Mediterranean and Rome, and later she again visited the Holy Land. In 1845 she visited Scandinavia and Iceland, and in 1846–48 made a tour of the world traveling in Brazil, Chile, China, India, Persia, Armenia, Caucasus and Turkey, and in 1851–55 made a tour which included England, South Africa, the Malay Archipelago, Australia and North and South America. Her last long journey was to Madagascar in 1856 and after many hardships and a narrow escape from death following imprisonment at the hands of Queen Ranavalona I, she returned to Vienna. Her travels covered 160,000 miles of sea routes and over 21,000 miles on land; a record which had never been approached by any woman traveler up to the time of her death. Among her works which have been translated into English are ‘Journey of a Viennese to the Holy Land’ (1843); ‘Journey to the Scandinavian North and Iceland’ (1846); ‘A Woman's Journey Round the World’ (1852); ‘A Lady's Second Journey Round the World’ (2 vols., 1855); ‘Last Travels: Inclusive of a Visit to Madagascar’ (posthumously 1861).

PFENNIG, a German monetary unit, equal to one-hundredth part of a mark. There are bronze coins of the value of one pfennig and two pfennige, or about one-fourth cent and one-half cent respectively. Nickel coins valued at five and 10 pfennige are also in use, and in silver a coin of 50 pfennige, or about 11 cents.

PFEUFER, pfoi'fĕr, **Karl von,** German physician: b. Bamberg 1806; d. 1869. He secured his professional education at the universities of Erlangen and Würzburg; practised eight years in Munich, from 1840 to 1844 was professor at Zürich, from 1844 to 1852 at Heidelberg, and from 1852 to 1869 at Munich. Pfeufer acquired an international reputation for his rational system of explanation of pathological and other conditions. He published ‘Ueber die Cholera Epidemie in Mittenwalde’ (1837); ‘Zum Schutz wider die Cholera’ (1849; 3d ed., 1854) and important contributions to the *Zeitschrift* für rationelle Medizin’ (1844 et seq.).

PFISTER, pfis'tĕr, **Albrecht,** German printer: b. Bamberg, Germany, about 1420; d. there about 1470. He was engaged in card-painting in Bamberg and about 1455 began printing with movable type. It has been claimed for him by some writers that he is the real inventor of the art of printing, but whether he invented his process or learned it as an assistant of Gutenberg has been a matter of doubt. His types, though similar to Gutenberg's, have some peculiarities. He printed prayer and school books, some of which are still in existence, as are also ‘Indulgences’ printed with metal types in the years 1454–55, an almanac of 1457 and a ‘Biblia Pauperum’ (1462). His crowning achievement was his Latin 36-line Bible in three volumes and comprising 881 leaves. These were printed in part with worn type which, it is claimed, was formerly in use by Gutenberg. In Pfister's books published about 1461 appear the first known printed illustrations, in the form of crude woodcuts. Consult Dziatzko, ‘Gutenbergs früheste Druckerpraxis’ (1890).

PFLEIDERER, pflī'dĕr-ĕr, **Otto,** German Protestant theologian: b. Stetten, Würtemberg, Germany, 1 Sept. 1839; d. Berlin, 20 July 1908. He was educated at Tübingen, and later in England and Scotland, and entered the ministry, serving at Tübingen and Heilbronn. In 1870 he became chief pastor and superintendent at Jena, and later was made professor of theology there. In 1875 he became professor of systematic theology at the University of Berlin, a post which he held till his death. He became widely known as a writer and lecturer, his inclinations being toward a liberal theology. His lectures in London in 1858 and in Edinburgh in 1894 were published in English. Among his works are ‘Die Religion, ihr Wesen und ihre Geschichte’ (2 vols., 1869–78); ‘Religionsphilosophie auf geschichtlicher Grundlage’ (1878–93); ‘Geschichte der Religionsphilosophie von Spinoza bis auf die Gegenwart’ (1893); ‘Evolution and Theology’ (English, 1900); ‘The Early Christian Conception of Christ’ (1905); ‘Religion und Religionem’ (1906); ‘Christian Origins’ (Huebach's translation, appeared in 1906); and ‘The Development of Christianity’ (by the same translator, in 1910).

PFLUGK-HARTTUNG, pfloog' här'toong, **Julius Albert G. von,** German historian: b. Warnikow, Germany, 8 Nov. 1848. He was educated at Bonn, Berlin and Göttingen, accepted the chair of history in the University of Basel in 1883 which he held until 1893 when he was made head of the Secret State Archives at Berlin. He is an authority on mediæval and papal history and has published 'Studien zur Geschichte Konrads II' (1876–77); 'Norwegen und die deutschen Seestädte' (1887); 'Krieg und Sieg 1870–71' (1895); 'Die Bullen der Päpste bis zum Ende des zwölften Jahrhunderts' (1901); 'Weltgeschichte' (6 vols., 1907–10); 'Das Befreiungsjahr 1813' (1913); 'Belle-Alliance-verbündetes Heer' (1915). A number of his important works have been translated into English, among them The Great Migration' and 'The Early Middle Ages — by Wright' (Philadelphia 1902); and 'The Franco-German War,' by General Maurice (London 1900).

PFORZHEIM, pfōrts'hīm, Germany, the fourth largest (1914) city of Baden, 15 miles southeast of Carlsruhe, on the northern edge of the Black Forest, at the junction of the Würm, the Nagold and the Enz. Among its buildings are the remains of an ancient castle, formerly the residence of the margraves of Baden-Durlach; the castle church, dating from the 12th century, containing the tombs of many of the margraves; the townhouse, a handsome building, rebuilt in 1892–95; the post office; a fine museum, a gymnasium, and many other educational institutions. The chief industry of the place is the manufacture of cheap jewelry, which employs over 22,000 hands. There are also chemical works, machine-works, forges, tanneries, copper-works, bleachfields, paper-mills, oil-mills, saw-mills, etc. The trade in wood is important, the timber being floated by the Enz and Neckar to the Rhine. There is also a considerable trade in oil, fruit, wine and cattle. The inhabitants distinguished themselves in the Thirty Years' War. Reuchlin, one of the most distinguished precursors of the Reformation, was born here. Pop. 73,786.

PFUHL, pfool, **Johannes**, German sculptor: b. Lowenberg, Silesia, 1846. He was educated at the Academy of Fine Arts in Berlin and later became an assistant of Schievelbein, under whom he had studied, and after his master's death in 1867 completed his designs for the bronze memorial in the Dönhoffsplatz, Berlin. His work includes several portrait busts, but his best work is seen in his colossal groups in relief. He has executed a frieze in rilievo in commemoration of the Franco-Prussian War, in the Military School of Lichterfelde (1876); an equestrian statue of William I, with Bismarck and Von Moltke, in Görlitz (1893); the Laube monument at Sprottau (1895); the Goethe monument (1902); the standing group of William I and Frederick (1902); the William I, of the Reichstag building (1905); and many others.

PHÆDO, fē'dō, or **PHÆDON** (Gr. *φαίδων*), philosopher: b. Elis. Having been captured in his youth, he was sold as a slave, and was brought to Athens by his owner B.C. 400. Freed through the influence of Socrates, he became one of his favorite students. After the death of Socrates, Phædo remained for a time at Athens and then returned to Elis, and there founded a school of philosophy of which no definite knowledge remains. The dialogue of Plato on the immortality of the soul, which contains the last conversation of Socrates with his scholars while he was in prison, bears his name; but no inference can be drawn from it as to his teaching. None of Phædo's writings, which were in the form of dialogues, have come down to us; but Seneca, in his 'Epistolæ ad Lucilium,' has a translation of an extract from one of his works. Mendemenus, who founded the Eretrian branch of the Eleatic school, was indirectly a disciple of Phædo, but to what extent he expressed the views of his teacher has not been determined. (See SOCRATES). Consult 'Life' by Mendelssohn (Leipzig 1871).

PHÆDRA, fē'drạ, in Greek mythology, daughter of Minos, king of Crete and of Pasiphaë, was the sister of Ariadne and wife of Theseus. Happening to meet Hippolytus, her step-son, whom she had never before seen, and whom she did not know to be the son of Theseus, she was inflamed with an ardent passion for the youth. He would not reciprocate, and to satisfy her revenge she accused him to her husband of a criminal attempt upon her honor. The father cursed his son, and Neptune soon carried his execrations into effect by bringing upon Hippolytus a violent death. When this event was known in Athens, Phædra repented of her crime and hanged herself. Seneca in his 'Phædra' and Euripides in 'Hippolytus' have taken Phædra as the subject of their tragedies, now lost.

PHÆDRUS, fē'drŭs, Roman author. Little is known of him but from his own writings. He was a slave brought from the Pierian district of Macedonia to Rome, and manumitted by Augustus. By the publication of the first two books of his 'Fables' he drew upon himself the ill-will of Tiberius' minister, the all-powerful Sejanus, who imagined that he saw in the fables reflections upon himself and Tiberius. The remaining books did not appear until after the death of Tiberius in B.C. 37. Phædrus introduced the fable into Latin literature, and a prose version of his work, prepared by one Romulus, was the basis of the mediæval fable. He was less a translator than an imitator — not always skilful — of Æsop, from whom only a small proportion of his material is taken. The five books remain in an imperfect state. They are written with more or less fluency in the iambic senarius, and exhibit great purity of style. It seems from contemporary records that Phædrus was not appreciated in his own period. The best editions of the fables of Phædrus are those of Bentley (1726), Orelli (1832), Koch (1846), Lucien Müller (1877), Riese (1885) and Havet (1895). Besides the above fables some have ascribed to Phædrus another group of 32, the 'Epitome Fabularum' or 'Fabulæ Novæ,' published from a manuscript of N. Perotti, archbishop of Manfredonia in the 15th century. The genuineness of these is doubtful. It is at least certain that among the genuine are many written by others. Consult Hervieux, 'Les Fabulistes Latins' (1893–96).

PHÆOPHYCEÆ, fē'ō-fī-sē'ē, a division of *Algæ* (q.v.) containing the brown seaweeds, whose color is due to the pigment phycophæin. The group is almost wholly marine, and mainly inhabits the cold seas, flourishing especially in the polar regions. The group includes the great kelps (q.v.) and other large-leaved forms, many of which have commercial value, or do an important service in protecting shores against excessive erosion. The various «rock-weeds» and «gulf-weeds» also belong here. The simplest *Phæophyceæ*, however, consist of single filaments. Reproduction takes place in a very variable manner. A sexual reproduction is the only means known in some forms, such as the kelps. It takes place by motile ciliated spores. Elsewhere sexual and asexual reproduction exist concomitantly. The sexual reproduction may vary between the fusion of equal free-swimming gametes and the fertilization of a non-motile egg by motile sperms. This latter mode of reproduction may form a stage in a definite alternation of sexual and asexual gentrations, or as in the case of *Fucus*, it may be the only mode of reproduction.

PHAER, or PHAYER, fā'ĕr, **Thomas,** English author: b. Kilgerran, Wales, about 1510; d. there, 1560. He had a legal training and studied medicine at Oxford. He settled at Kilgerran in Pembrokeshire where he practised both professions; publishing two popular handbooks of law, and a number of booklets on medical subjects. From 1544 onward he wrote considerable poetry which was published locally. He translated in heroic ballad metre the first nine books of the Æneid, publishing seven books in 1558, but died before the completion of the other two. Oxford gave him the degree of M.D. a year before his death.

PHAËTHON, fā'ĕ-thŏn, in Greek mythology, according to the myth most generally accepted, the offspring of Helios and Clymene, and brother of the Heliades. To please his unfortunate mother, and to satisfy those who doubted whether the Sun were his father, he desired the latter to grant him a favor. Helios imprudently promised it unconditionally. Phaëthon asked permission to take his father's place as driver in the chariot of the Sun, and would not be denied. But he had scarcely mounted the flaming car and taken the reins, when the celestial horses, despising the weakness of their mortal charioteer, turned out of the path, and set everything on fire. The Ethiopians, on the left, were blackened by the near approach of the sun; and when the chariot careened dangerously over the earth to the right, Zeus with his bolts plunged the helpless driver into the river Eridanus or Po. His sisters found him there lifeless, and lamented him. They were changed into poplars, and their tears into amber. The god of the sun was also called Phaëthon (the enlightener).

PHAETON, the tropic-bird (q.v.).

PHAGOCYTOSIS, a process of destruction of foreign bodies by living cells. The term was originated by Metchnikoff, the Russian scientist, who founded upon the process a theory of immunity to disease. He observed that in many infectious diseases there was an increase in the number of leucocytes or white blood-cells in the body. These were observed to be greatly increased in the neighborhood of an infected area, and he further noted that these leucocytes were capable of enveloping or swallowing as it were the invading bacteria, and destroying them by a process of intercellular digestion. The enveloped substance might, however, resist digestion, in which case it would be disgorged after an interval; or the organism swallowed might be the stronger and destroy the cell which engulfed it, and multiply at its expense. The white blood-cells were early termed by Metchnikoff the protecting army of the interior, which always stood ready to annihilate the bacterial foe. He explained inflammatic as a phagocytic reaction of the animal organism against an irritant, the phagocytes swarming to the affected locality, settling about the noxious bacteria and swallowing them. The injection of protective serums has been supposed by some to act through arousing the phagocytes to unusual activity. While this early theory rested upon a mechanical basis, and is now accepted only as to that view, it has nevertheless stimulated an immense amount of research along this line, and the general theories of phagocytosis are broader now than formerly, including distinct chemical reactions. It is now known that not all leucocytes are phagocytes; the lymphocytes are not; the eosinophiles are never phagocytic, although they are elements in the struggle of the body against infecting foreign bodies. The polynuclear and hyaline leucocytes are the chief agents in phagocytosis. It is further recognized that some of the fixed cells of the body have some phagocytic power. The endothelium that lines the blood-vessels can take up and destroy bacteria. Many epithelial elements, as in the mammary glands, and in the respiratory mucous membrances, can destroy bacteria; otherwise infections would be much more frequent than they are. The phenomenon of phagocytosis has been shown to be a much more complicated one than Metchnikoff at first supposed, but he has been able to defend and develop his theory with much skill in view of the many recent studies on immunity. It is certain that phagocytosis is an important mechancial process in the struggle with disease, but it is only one of the many biological agencies utilized by the body in this conflict. See BLOOD; IMMUNITY; INFLAMMATION.

PHALANGERS, fā-lăn'jẽrs, a group of small polyprotodont marsupials, which owe their name to the fact that the slender fourth and fifth toes of the hind feet are united in a common integument. They have thick wooly coats of such density as to repel a charge of shot from an ordinary gun. The great toes are opposable, and are destitute of nails, the other digits being provided with curved nails. Some varieties have prehensile tails. The phalangers are about the size of the house cat, and are adapted for an arboreal life. They inhabit the trees of the forests of Australia and the Papuan Archipelago. They are nocturnal in habits, and feed upon fruits and leaves, but some varieties also devour grubs and young birds. In confinement they are found to prefer flesh as an article of diet. They are eaten by the natives of the countries in which they occur, although the flesh is said to emit a strong and offensive odor.

These animals are grouped in a family (*Phalangeridæ*) which is composed of several sub-families. The *Tarsipedinæ* contains the genus *Tarsipes* alone. In the *Phalangerinæ* are included 10 or 12 genera and numerous species, among them the typical phalangers, the flying-phalangers and the flying-mouse. The largest of them is the «vulpine» or true phalanger, exampled by *Trichosurus vulpecula,* the size of a small fox. The flying phalangers are provided with a parachute-like expansion of the skin between the fore and hind limbs; by which they can make long skimming leaps from tree to tree as do the flying-squirrels of northern countries. The foremost genus is *Petaurus,* and the best known species is *P. breviceps,* which bears a remarkable resemblance to an American flying squirrel, but is somewhat larger. The flying-mouse is the minute *Acrobates pygmæus,* which is not more than six inches long, including the plume-like tail. The koala and wombat (qq.v.) are also phalangers.

PHALANGES. See ANATOMY; OSTEOLOGY.

PHALANGIIDÆ, făl-ăn'jid-ē, a family of arachnidans, the daddy-longlegs (q.v.) or harvestmen, one of six families of the order *Phalangida,* or with scorpions and false scorpions constituting the order *Arthrogastra* of Packard. The distinguishing feature is the fact that the abdomen is distinctly six-segmented, instead of the usual nine, but the cephalo thorax is unsegmented. The legs are very long in most species though relatively short in others, and are many-jointed. The pedipalps are short and leg-like, the last segment with a claw at the end, and the chelicerae three-jointed and chelate. The organs of respiration are tracheæ, and there are no spinning-glands. These creatures live in the grass for the most part, and feed upon plant-lice and other minute insects. Many common American forms may be found described and illustrated by Wood, in the *Proceedings* of the Essex Institute (Salem, Mass.), Vol. VI. Consult also Comstock, J. N., ‘The Spider Book’ (Garden City, N. Y., 1912).

PHALANSTERY. See FOURIERISM.

PHALANX, fā'lănks or făl'ănks, a word used by the Greeks to designate the mode of formation of the heavy infantry of the Greek armies. Three Greek states acquired renown for their superior organization and use of the phalanx — Sparta, Thebes and Macedon. In all of them it consisted of several ranks of infantry in close array, armed with long spears as their principal weapon. The organization of the troops composing the phalanx varied in different states, but generally they were arranged in regular divisions under officers of various ranks, as in a modern army. The Spartan phalanx varied in depth, according to circumstances, but was commonly eight ranks deep. The Theban phalanx, particularly under Epaminondas, was much deeper, reaching 12 ranks, the longest spears being 18 feet long. At the battle of Leuctra he kept one of the two divisions into which the phalanx was usually divided retired, using it to strengthen the other wing in depth. The phalanx was perfected by Philip of Macedon. He increased the length of the spears to 24 feet and the number of ranks to 16; and the lines were arranged at such intervals that the spears of the fifth rank projected three feet in front of the first, so that the front was protected by a solid array of five lines of spears. The men were also armed with large shields which nearly covered the body. The rush of the phalanx was well-nigh irresistible, but it was unwieldy, and was abandoned because it could not be manœuvered quickly and failed altogether when the fighting became hand to hand.

PHALARIS, făl'ą-rĭs, ruler of Agrigentum in Sicily remembered as the “Tyrant”: b. near Cnidus, Asia Minor, 6th century B.C. He ascended the throne about 570 B.C. and though apparently elected by his fellow citizens appears to have usurped despotic authority. His history is largely enveloped in fable, and his name has become symbolical of savage cruelty, his most infamous act being the roasting alive of prisoners in the brazen bull, in which he is said to have first executed its inventor, Perillus. In an insurrection 16 years after his accession to the throne Phalaris himself was overthrown and tortured in the same horrible manner. Later traditions attempted to paint him as a humane and high-minded ruler on the strength of the ‘Epistles of Phalaris,’ 148 letters (first printed in Venice, 1498) attributed to him. But these were proved by Richard Bentley (q.v.) in 1697–99 to be spurious. Consult Freeman, E. H., ‘History of Sicily’ (New York 1892).

PHALARIS, a genus of grasses, of which the fruit of one of the species (*P. canariensis*) or canary-grass, is canary-seed extensively employed as food for birds. See CANARY-SEED; GRASSES OF THE UNITED STATES.

PHALAROPE, a snipe-like shore bird of the Northern Hemisphere belonging to the family *Phalaropodidæ.* They are from seven to nine inches in length and have a straight slender beak and lobate toes, enabling them to swim well. The females are larger than the males, more brightly (and very handsomely) colored and more aggressive than their mates. These birds spend their summers in the Arctic regions and nest in a shallow cavity in the ground dug and lined with grass by the male. The female lays three or four very dark-colored eggs of olive-gray blotched with chocolate. These are incubated by the male alone. Their flesh is oily and of poor taste. In winter they migrate southward, spreading over both the Old World and the New. Two of the three appear commonly in the United States,— the northern phalarope (*Phalaropus lobatus*) which in winter passes numerously all along the Atlantic Coast; and the distinctively American variety, Wilson's phalarope (*Steganopus tricolor*), the largest of all rare on the coast but common all over the Rocky Mountain region and breeding in northwestern Canada as far south as the borders of Dakota. It is an esteemed game bird in the mountain lakes of the high Western Plains. The red phalarope, or gray phalarope (*Crymophilus fulicarius*), is rare here, but familiar in Europe and Asia. It is thus variously called because of its rich, brownish-red plumage in summer changes to gray (and white) in winter. Consult Coues, E., ‘Birds of the Northwest’ (Washington 1874); Forbush, E. H., ‘Game Birds, Wild-Fowl and Shore Birds’ (Boston 1912).

PHALLACEÆ. See FUNGI.

PHALLICISM. A form of nature worship which particularizes upon reproduction as symbolized by the sex-organs. The fact determinant for phallicism was the discovery by primitive man of natural objects resembling the male (Greek, phallos) or the female (Greek, kteis) organ of generation. A roughly cylindrical stone or rock was considered an erect penis; a stone or rock, amorphous in general but showing any sort of cleft, was considered an opened vulva. Wherever a further correspondence of size or color (red for male, black for female) appeared, the object was all the more esteemed. The term ithyphallie "erect phallos" is superfluous, since all phallic symbols are erect.

Among all the varied objects of man's worship, alike in the mineral, vegetal and animal worlds, this phallos and kteis enjoyed the distinction of correspondence of form to the necessarily and therefore invariably, human-like deities that man sought to discover and to influence as the controllers of his changing fortunes. Such resemblance would afford the most powerful aid possible to that nature-worship which, co-ordinate with ancestor-worship, mediated all forms of religion. Man is the measure, here as in every other cultural. In consonance with these facts and this principle, phallicism was both a primitive and a universal practice. It combined admirably with the likewise obvious, primitive and universal myth that the outstretched Father Heaven discharges the fertilizing rain into the lap of recumbent Mother Earth, who then teems with all living things. Phallicism still so combines in the cosmologies of the Japanese; but by other people has been associated with various other nature-gods distinguished for productive energy, as will appear in the following ethnical sketch.

An original phallos and kteis are sometimes found in the same region, occasionally in proximity; otherwise a phallos is made for the kteis or a kteis for the phallos. The same sex-dualism prevails for the later deities in all religions, with few exceptions. An adequate term for the system would therefore be phalloktenism.

That phallicism was not solely a species of magic, but a form of religion is evident from the use of phallos or kteis as an idol whether under a shrine or in the open, the offering to them of food and drink, or the presentation of small duplicates as votives, accompanied by petition or thanksgiving. This use of the artificial phallos as a votive led to its facture by thousands in stone, wood, iron and clay. No artificial kteis is known to be used as a votive to either the phallos or the phallos with kteis. Other uses of the phallos dispense with all cult and must therefore be regarded as magic of the sympathetic type. The purpose of phallicism was naturally to secure fertility equally of cereals, animals and humans. Phallie festivals sometimes permitted sexual liberties beyond the laws commonly observed.

Phallicism was freely practised throughout Japan until in 1872 foreign influence began to suppress it, but in-yo-seki, "female-male-stone" may still be met in the remoter regions. Natural phalloi and ktenes occur in all sizes from rocks, one of which formed a whole islet, named Onogoro, down to pebbles. No artificial ktenes are made but the *awabi* (haliotis) shell is offered as votive to a phallos by infertile or sick women. Artificial phalloi are wrought in great numbers for use as votives to a natural phallos or a phallos-kteis. Also a large artificial phallos may be placed near a natural kteis to complete the pair. The peach and the bean are used also as symbols of the kteis and the mushroom and the hog's snout similarly for the phallos. Phallos and kteis are credited with promoting pregnancy, parturition and the cure of all diseases of the generative system. The phallos serves also as symbol of the road-god and as patron-god of harlots, a small specimen often appearing, among other symbols on the *kami-dana* "god-shelf" of the house. The offerings made to phallos and kteis are the usual ones of food, drink and light. This cult aptly interprets the cosmology given in the Kojiki that Izanagi (Male that invites) and Izanami (Female that invites) stirred the ocean with "a jeweled spear," which dripped from its end the sea water that made the islet Onogoro. The naked pair then ran around a "heavenly pillar," and begat the remaining islands of Japan. Since the phallos was life-giving, it could also avert diseases and other ills, which traveled, as men do, on roads and therefore became road-god, appearing on road-sides and cross-roads. Such deities were the Sahe no Kami "Preventive Deities," comprising an Eight-road-fork Prince with a consort, Eight-road-fork Princess and a third, Kunado. They had no temples and their festivals were held at cross-roads. Another phallic road-god was Dosojin "Road-ancestor deity," a popular name for Saruta-hiko of the Kojiki, represented by a natural boulder, often with a pile of stones before it. These deities were supplicated by travelers before starting on a journey and were also invoked in *tsuji-ura*, a form of divination conducted at cross-roads. At a few famous phallic shrines, the annual festival has permitted promiscuous coition.

Several popular sex-myths are reported in Mayer's "Chinese Readers Manual," several sex-ceremonies are described in De Groot's "Fêtes Annuelle à Amoui" and M'Clatchie construes the trigrams as conventionalized sex-symbols, yet no phallicism has been discovered in China. Chinese scriptures, both the king and the shu are devoid of sex-myths, as unimaginative as are the Chinese tablets, ideographs, literature and entire culture.

Phallicism, prehistoric in India as elsewhere, but unknown to the Veda, was only later united with Rudra, a storm-god as chief trait in Siva, god of destruction and reproduction, symbolized along with his wife, Kali, in millions of *linga-yoni*, a mere stone cylinder or cone erect upon a stone disc. Natural — large stones or rocks — *linga* are considered of their own nature pervaded by the essence of Siva, so that shrines are built over them and a *yoni* is then usually added. Not less sacred are certain pebbles found in rivers. Two such are oval shaped, one being the *bana-linga* of white quartz, for Siva and another the *sala-grama*, a black pebble containing ammonites — fossil shells — the spiral of which suggested the serpent, for Vishnu. These two, with a bit of metallic stone for Ganesha and a crystal for Surya, are used in the *panchayatana*, the daily household rite in India. The cult of the *linga-yoni* consists in decorating it with flowers, pouring milk over it, and wrapping it with bilva leaves, in order to allay its irritation. Vigil and fasting accompany this cult on the great Sivaite festival, 27 February. Artificial *linga-yoni* need "endowment with breath," namely consecration by a Braham. The Sankhya philosophy regards the *linga-yoni* as symbols of the eternal principles: Prakriti, the one creative force or matter, female; and Purusha, innumerable spirits, male. But among the masses phallicism promotes sexual excesses in the cult of Siva's consort, one of the forms of Sakti (the female energy in nature) and by obscene carvings and pictures in the Sivaite temples, though no more of either practice than the unrelated Vaishnavism presents. Both systems are products of the Indian heredity and environment.

Tibetan Buddhism probably derived its prayer-wheel formula, "*Om mani padme Hum*," from Saivism, with the meaning "*Om* Jewel (the *linga*) lotus (the *yoni*) *Hum*." In the East India Islands phalloi figure as members on the statues of ancestral deities and are accompanied by crocodiles as symbols of bravery, the other chief male attribute.

The primitive phallicism of Greece was later adopted by several cults. Dionysos was celebrated in a rite (resembling that of the consort of his Indian analog, Siva) where phallos and kteis were borne in procession, sacrificial victims were torn apart and devoured raw, wine drunk, and dancing with wild cries practised, all ending in coition under cover of darkness. Out of the coarse humor inseparable from such scenes, Greek genius developed comedy. In the Thesmophoria, celebrated by women alone in honor of Demeter and Kore, phalloi and snakes made of dough were carried about with fircones and dedicated to these goddesses of agriculture. Concurrently the participants indulged in flitting indecent chaff, doubtless with the purpose of stimulating reproduction in both earth and humans. The Haloa, a festival in honor equally of Demeter, Kore and Dionysos, resembled the Thesmophoria, but here the symbols represented both sexes and the priestess whispered into the ears of the women present words that might not be uttered aloud. Both phallos and kteis were used also at the Eleusinian mysteries; some authorities think with the usual symbolism of fertility, while others believe that they connoted rebirth after death. The minor deity, Priapos, showed by the conspicuous phallos of his statues that he represented the merely sensuous factor in reproduction. At Greek marriages a phallos, with other symbols of plenty, were carried in the *liknon*, doubtless as a charm to produce the thing signified.

The phallic deities native to ancient Rome are unfamiliar to the modern reader, because they were early identified with correspondent Greek deities and thenceforward passed under Greek names. Such were Mutunus identified with Priapos and Liber with his consort Libera, identified with Bacchos and Aphrodite. Liber and Libera were represented in their shrine simply by a phallos and kteis. The extreme grossness of this cult is evidenced by the bronze figures now preserved in the Naples Museum. As late as 1781 Sir William Hamilton could collect votive phalloi in Naples and forward them to the British Museum. Phalloi were widely used by the children of ancient Rome as amulets and are still so used in Italy.

The three great gods of northern Europe were represented (according to Adam of Bremen) at Upsala in Sweden by three images: Odin (or Wodan) as a warrior in mail, Thor with his sceptre holding, as greatest god, the middle place, and Freyr with his customary phallic symbols of fecundity and peace. Evidence of a similar cult in France and Belgium remained during the Middle Ages and later in the practice of supplicating phallic saints, such as Saint Foutin, for offspring or the cure of venereal disease. As late as modern times female figures with conspicuous vulva appeared in carving over church doors in Ireland and England, but most of them have now been removed. Those in Ireland were called *sheila-na-gig*. Definite evidence in some cases and survivals in others show that throughout mediæval Europe spring festivals usually culminated in sexual orgies. A survival from phallic symbolism in the druidical use of the significantly shaped mistletoe appears in its exclusion from church decorations at Christmas, but its welcome to hang in every house, where it licenses kissing beneath its bough. Also English farmers used to decorate with mistletoe the first cow to calve in the New Year.

Turning to the Semitic peoples, we find Baal and Astarte (Istar, Baalat) worshiped together, commonly under the form of a stone pillar called *masseba* and a tree or stake called *ashera*. Monuments and records indicate that these were just a phallos and kteis. This cult, as practised by the Canaanites, proved a licentious snare to the Israelites who were urged by their prophets "to dash in pieces" the *masseba* and "to cut down" the *ashera*. (Exodus xxxiv, 13, Revised Version). A "cleft in a rock" served as natural kteis and the "smooth stones of the valley" as phalloi, doubtless in Palestine as everywhere else. (Isaiah lvii, 5–6, Revised Version). The unconvincing arguments of Robertson Smith and the Encyclopædia Biblica against this view have been disproved by recent excavations of phalloi from the ruins of Nippur and of Tell Lob in Babylonia and at Lachish, Gezer and other sites in Palestine.

In Egypt the phallos was attached to the images of Min (Khem), old father Nature, accompanied by his consort, the cow-horned Hathor, a pair upon whom all the force and pleasure of life depend. Furthermore, the phallos of the great creative god, Osiris, is prominent equally in his myth, his representation and his ritual. Phallicism is current among the Tusayans, Pueblos and other Redskins of North America; and its symbols have been found in Mexico, Central America, Peru and other parts of South America. As examples of phallicism in West Africa there may be cited the Ewe-Speakers, the Yoruba and the Dahomeyans.

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EDMUND BUCKLEY.

PHALLUS (Greek, *Phallos*), a symbol of the productive principle of nature as exemplified by the male sex in contradistinction to the female. See PHALLICISM.

PHANARIOTS, fa-när'ĭ-ŏts, or **FANARIOTS**, Greek inhabitants of Fanar, Constantinople. They were of Byzantine descent and when Mohammed II conquered Constantinople he granted them the quarter of Fanar in recognition of their services. The district takes its name from the «beacon» which stood on the promontory extending into the Golden Horn. The Phanariots were descended from some of the oldest and noblest Byzantine families, and their superior intelligence soon gained for them a dominant influence over the ignorant Turks. Among them were poets and dramatists of considerable renown. They were ambitious, avaricious and double-dealing, and their subtle intrigue soon gained for them high political places, in which they displayed much selfishness and greed. The offices of dragomans, secretaries, etc., were filled by them as well as many civil offices and the hospodars of Moldavia and Wallachia were appointed from their ranks from 1716 to 1821. Their position became one of great power and importance, but they never showed any appreciable degree of patriotism and when the war of Liberation broke out their services fell far short of the importance which their wealth and position should have made them. Since the revolution (1822) their power has been broken and as a class they have no longer any political influence in the affairs of Turkey. Consult Tennent, ‹History of Modern Greece› (1845).

PHANEROGAMS, the class of the flowering plants; those in which the sex processes are plainly observable, as distinguished from the Cryptogams, in which these processes are concealed. Neither of these terms is strictly accurate, but they are in common popular use. See Cryptogamous Plants.

PHANTASIASTS, făn-tā̆'zĭ-ạsts, Monophysites of the 6th century, who believed that the Divine nature had so transformed the body of Jesus from the very moment of His conception that His apparent body had become ethereal, imperishable and immortal. It felt neither hunger, thirst, fatigue nor pain, but only semblances or phantasms of these affections, and His whole human «life» was only a vision, and that He did not and could not from his spiritual nature suffer and die upon the cross. Prominent among the adherents of this sect were Julian, the bishop of Halicarnassus, and, in his latter days, Justinian (q.v.). They were known also as Aphthartodocetæ Docetæ, and were grouped with others under the title of Manichæans.

PHANTASMAGORIA. See Magic Lantern.

PHARAOH, fā̆'rō, the Hebraic name given in the Bible to the kings of Egypt, corresponding to the PER-'O (Great House), P-RA or PH-RA of the Egyptian hieroglyphics, which signifies the sun.

The Pharaohs mentioned (Gen. xii; 10) in the time of Abraham (believed to be Osirtesen I) and Joseph (the latter, according to tradition, minister of Apophis II Aa-Kenen-Ra), were probably the shepherd kings or Hyksos. The Pharaoh in the time of Moses, 200 years later, was Rameses II, the Sesostris of the Greeks. He was succeded by his son Meneptah II, and the Exodus took place either under the latter, or in the reign of his successors Seti II and Ei-Ptah. The two Pharaohs mentioned in the reign of Solomon, the one who gave his sister-in-law to Hadad the Edomite, and the one whose daughter Solomon himself married, were the last kings of the 21st dynasty. The Pharaoh mentioned as the opponent of Sennacherib was probably the Sethos of Herodotus. Pharaoh-Necho is the first Pharaoh mentioned in the Bible whose proper name is recorded. He is mentioned by Herodotus under the name Nekôs. He was the king of Egypt during the reign of Josiah, Jehoahaz and Jehoiakim, kings of Judah. Pharaoh-Hophra succeeded Necho. He is identified with Apries, who reigned from about 590–571 B.C., but the dates of both the beginning and end of his reign are variously stated. He is the last Pharaoh mentioned in the Bible narrative. Several kings of Egypt are mentioned in the Bible who are not called Pharaoh. See Egypt.

PHARAOH'S ANT, the tiny red ant (*Monomorium pharaonis*), which is a household pest in almost all parts of the world. It makes its nests in the walls or under the floors of houses, and forms long trails to any bit of acceptable food that may be discovered, preferably sweets or some kinds of cooked meats. Within a few hours such dainties may be taken possession of by swarms of ants numbering tens of thousands. Why it is so called is not clear. Several other familiar and troublesome animals are called by the royal name as «Pharaoh's hen,» the Egyptian vulture (q.v.), and «Pharaoh's rat,» an ichneumon (q.v.). Consult Lubbock, Sir J., ‹Ants, Bees and Wasps› (London 1882); Wheeler, W. M., ‹Ants: their Structure, Development and Behavior› (New York 1910).

PHARISEES, a religious sect of the ancient Hebrews who based their division from other sects upon their unbending adherence to the Mosaic laws governing the division between the clean and the unclean. This party probably became a distinct sect as a result of the reaction against the attempt of Antiochus Epiphanes to eliminate the distinctions between the Jews and the Greeks, and as a party were in opposition to John Hyrcanus, the high priest (135–105 B.C.), who reigned over the state founded when the Maccabean revolt was brought to a successful termination. They were also in opposition to the Sadducees, being essentially a religious sect, opposed to anything non-Jewish, and rarely engaged in political strife unless some of their rights or privileges had been outraged. The principles of the Pharisees were many and varied. As their name signifies (separatists), they held aloof from all intercourse with the lower classes; even their orthodox countrymen, unless they lived up to the Pharisaic interpretation of the laws, were shunned by them; and they carried their religious fanaticism to such an extent that laws were even imposed upon members of their body prohibiting trade with disbelivers. They, however, worshipped with their countrymen in the same synagogue under the command of their great rabbi: «Separate not thyself from the congregation.» They insisted upon a strict observance of the laws as being necessary to righteousness, though they placed more weight on the belief in traditional laws than on the written laws, and extended the observance of these laws to the tithes, fasts, Sabbath worship, the ablution of hands, vessels, etc. Especially in the matter of tithes they preserved rigid watchfulness, holding that only food which had been tithed could be partaken of without sin. This was the preliminary requirement imposed upon candidates for admission to the sect. Among the Pharisees themselves there were four ranks of purity, according to the degree of cleansing practised by the individual. They also believed in the existence of an oral law to complete and explain the written law (the Torah), in which was set forth the continuance of life after death, the immortality of the soul, the resurrection of the dead, human freedom, providence, etc. We find in the Mishna that «Moses received the law from Sinai, and delivered it to Joshua and Joshua to the elders, and the elders to the prophets, and the prophets to the men of the great synagogues.» In the course of time these laws received many additions which were not supposed to be of divine origin, but were made by both the writers of the sacred books and the commentators.

The Pharisees came into prominence more particularly in the time of Christ because of their opposition to the principles of religion as taught by him. But their main objection to Jesus and the disciples lay in the fact that they associated so freely with the publicans and sinners, this being in direct contradiction to all the traditions and beliefs of the Pharisees. Jesus also taught that the religious relationship should be one of personal fellowship, while with the Pharisees this was held to be one only of legal compact. This doctrine the Pharisees perceived, if allowed to gain influence with the people, would lose to them their power, hence their desire to be rid of him, even if by death.

The Pharisees have, however, been misunderstood and maligned, especially as to being hypocritical. This party was the popular party of the day, having as members some of the most learned, pious and patriotic men of the country, and, as in all sects where strict adherence to principle is an intensely religious duty, some defects of virtue crept in, but to stigmatize all as insincere and hypocritical is beyond reason. It is to be remembered that Simeon, Zacharias, Gamaliel and Paul of the Bible narrative were all Pharisees.

Josephus is authority for the assertion that under the Herods the number of the Pharisees exceeded 6,000. The sect survived until long after the fall of Jerusalem in 70 A.D., still believing in the restoration of the kingdom of Israel through divine mediation. Consult Delitzsch, F., 'Jesus und Hillel' (Erlangen 1866; Monkhouse trans., London 1877); Milman, H. H., 'History of the Jews' (London 1863).

PHARMACEUTICAL SCHOOLS. See EDUCATION, PROFESSIONAL, IN AMERICA.

PHARMACOPEIA, fär″mạ-kō-pē′ĭ-ạ, a book of directions or formulæ for the identification and preparation of medicines which has received the official sanction of the government, or at least that of a responsible body of practitioners. Such a book is issued in every leading country, and contains a list and description of the substances used in the treatment of disease and included in the materia medica (q.v.), with the chemical processes for obtaining them, their purity-tests, the prescriptions most approved, etc. The object of the pharmacopeia is to so standardize drugs as to secure a uniform compounding of prescriptions by pharmacists. After 1542 when the first pharmacopeia, that of Nuremberg, appeared, these books gradually superseded the treatises of apothecaries and increasingly acquired a more authoritative character. In 1618 the London College of Physicians issued its pharmacopeia, of which 11 editions afterward appeared; the last in 1851. Until the passage of the Medical Act in 1858, separate pharmacopeias were published by the colleges of physicians of London, Edinburgh and Dublin. Since that act went into effect a British pharmocopeia issued by the medical council of the United Kingdom has been recognized by the general medical profession of Great Britain.

The pharmacopœia of Prussia, which is used throughout Germany and the «Codex medicamentarius» of France, in use also in most of the countries of South America and in Turkey, are the most important published in the continental countries of Europe.

In the United States the first pharmacopeia was published in Philadelphia in 1778; in 1805 appeared another in New England; others were afterward issued by hospitals and other medical institutions; and in 1818 medical societies in New York planned a convention of delegates from medical colleges and societies in the various States, which was held in Washington, January 1820. Out of the transactions of that convention came, in the same year, the first pharmacopœia published in the United States. This was called 'The Pharmacopœia of the United States of America,' and was printed in Latin and English at Boston. A second edition of this pharmacopœia appeared in 1828. In 1830 two others appeared, one published in New York and the other in Philadelphia. These were eventually combined and a second edition issued in 1842. The third edition was published in 1851, and a revision in 1855. The fourth revision was issued in 1863, and the fifth in 1873. In 1882 the sixth edition appeared, and steps were taken to secure government sanction. The medical officers of the army and navy were enlisted in a new revision which was published in 1893 and was made the official pharmacopeia of the United States. It is not required by Federal law that this pharmacopeia shall be followed in the medical practice of the country, but it has been adopted as the legal standard in many States.

At the International Conference for Unification of the Formulas of Heroic Medicines, at Brussels, each country being represented by a physician and a chemist, new standards of strength for all very potent drugs were agreed upon and pledges were made by each government that the national pharmacopœia should conform. The new 'United States Pharmacopœia' has adopted the results of the Brussels conference, and it will be the first national pharmacopeia of international scope.

Revision of the Pharmacopeia.— National regulation of the purity and strength of drugs was still in the future when the eighth revision of the Pharmacopeia (held in 1900) became official, 1 Sept. 1905. The Federal law which bears the short title «The Pure Food and Drugs Act, June 30, 1906,» was passed the following year, and became operative on 1 Jan. 1907. This law specifically designated the Pharmacopeia as the legal standard, and thereby gave it a standing which it had not previously attained. The vigorous manner in which the authorities proceeded to execute the law, at once caused thousands who had known the book simply as a name, or not at all, to buy or use it. The Pharmacopeia has thus become a part of the Federal law, as well as of the laws of many of the States which enacted statutes based on the Federal Pure Food and Drugs Act; and since the organization which owns and controls it is an incorporated body, the meeting of the United States Pharmacopeial Convention, for the last revision of the work, which took place in Washington 10-12 May 1910, exceeded in importance any of the conventions which had previously been held to make or revise the book. The far-reaching effect of the work of manufacturers and importers, retail pharmacists, food and drug officials, and practitioners of medicine made it important that each of these interests should be well represented in the convention. Wholesale and retail druggists' organizations and medical societies had been discussing the Pharmacopeia with a view, particularly, to protect the public against the evils of low-grade drugs, and at the same time safeguard their own interests by impressing upon those most interested the importance of considering the interests of all concerned.

The United States Pharmacopeial Convention is itself an incorporated body, chartered under the laws of the District of Columbia 7 July 1900, and is continuous, with power to conduct future revisions under the constitution and by-laws framed by the convention.

The convention for the 9th decennial revision was held in the New Willard Hotel, Washington, and was attended by about 325 delegates, representing about 157 medical, pharmaceutical and chemical societies and associations, government departments, etc. The report in detail of the action of the convention is published officially in *The Druggists Circular* for June 1910.

The revision became official 1 Sept. 1916. Among the recommendations adopted by the convention was the following proposed limit to the scope of the Pharmacopeia:

«We recommend that this committee of revision be authorized to admit into the Pharmacopeia any medical substance of known origin; but no substance or combination of substances shall be introduced if the composition or mode of manufacture thereof be kept secret, or if it be controlled by unlimited proprietary or patent rights, and the list of substances should be carefully selected, with standards for identity and purity, as far as possible. Substances used only for technical purposes should not be admitted to the next Pharmacopeia, and a statement should be placed in the preface to the effect that standards of purity and strength prescribed in the text of the Pharmacopeia, are intended solely to apply to substances which are used for medical purposes or in determining the identity and purity of the same.»

Another of the «general principles» of revision adopted was:

«That the committee be instructed to revise as carefully as possible the limits of purity and strength of the pharmacopeial chemicals and preparations for which limiting tests are or may be given. While no concession should be made toward a diminution of medicinal value, allowance should be made for unavoidable, innocuous impurities or variations due to the particular source or mode of preparation, or to the keeping qualities of the several articles. The 'purity rubric,' which limits the percentage of innocuous impurities, as introduced into the eighth revision, should be continued, and tests and requirements should be appended to each article carrying a 'purity rubric.' In the case of crude drugs and natural products, the limits of admissible impurities should be placed at such a figure as to exclude any that would not be accepted by other countries.» Consult Flint, J. M., 'Report on the Pharmacopœias of All Nations' (Washington 1883).

PHARMACY. Definitions.— (1) Pharmacy is the art of preparing and dispensing remedial agents. (2) The term Pharmacy is also applied to the place (shop or store) where medicines are prepared or sold, for example, a drug store or apothecary's shop. The pharmacist is the operator or dispenser, known also as druggist, or pharmaceutist (in England, chemist or pharmaceutical chemist). The product of the pharmacist's skill is called a pharmaceutical preparation or compound. At present, owing to the evolution that has largely transferred to manufacturing establishments, or factories, the making of specialties, and many compounds employed by physicians, such trade compounders are known as manufacturing pharmacists. Thus the differentiating terms retail pharmacist and manufacturing pharmacist now prevail.

The word pharmacy, derived from the Greek word φαρμακον signified in early times either «the use of medicine» or «the practice of witchcraft.» The past record of the art, in all countries, seems to be fairly outlined by these definitions. In all cases, the early record of pharmacy is intricately connected with the practice of medicine, nor is it possible to write the history of one, without entering, somewhat circumstantially, into the story of the other.

Beginning of Pharmacy.— The beginning of the practice of pharmacy may be located in the efforts of primitive people of all ages to counteract disease or to relieve injuries. The very earliest literature of all nations gives proof of the study, as well as does the practice of the aborigines of every land. Scriptural reference to the «dead flies in the ointment of the apothecary,» the fig poultice applied by Isaiah, and the many references in Jeremiah and elsewhere in the Scriptures to the medicinal virtues of leaves and plants are familiar to all readers of the Bible, and give proof of the practice of the art of pharmacy among the Hebrews.

In Assyria, cuneiform inscriptions teach that the healing art was practised by the priesthood at a very early date.* Ancient Egyptian inscriptions[1 2] illustrate the process of distillation, while a papyrus 3300 years B.C.[1] gives prescription formulæ. Recent explorations have brought to light the interesting code of Hammurabi, king of Babylonia, 2250 B.C.,[3] in which we read of the doctor healing the sick, and the surgeon operating with the knife, but in which we find no reference to the compounding of medicines. By inference, then, we know that the physician and the pharmacist of ancient Susa must have been identical, since it is to be presumed that, had this not been the case, a document embodying such minutiæ of details in law would have considered penalties for pharmacists' blunders, as well as for medical and surgical malpractice. In China and Japan, pharmacy, coexistent with their earliest records, is a curious art, while India, as shown in its «Charaka-Samhitā»[4] (8th century, or earlier), is to be credited with a wonderful detail study of drugs and simple pharmaceutical preparations.

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* For references see end of article.

Glancing rapidly over the history of the world, we find in all countries and in all ages a like development of the pharmacist's art. Swayed originally by religious principles, the people looked naturally to the priest as councilor and helper, for physical as well as for moral ailments. In mediæval times, «Christ as an Apothecary,» surrounded by the well-known implements of the art, was the subject of more than one painting. Of the semi-barbarous tribes of mediæval history, the Druids, who were held in such veneration by the people that their authority was almost absolute, were especially proficient in mystic rites and medicine.[5] It is recorded that «the nine rural arts known and practised by the ancient Cymry, before they became possessed of cities and a sovereignty,» which was before the time of Prydain ab Aldd Mawr, about 1000 B.C., was medicine.[5] The aborigines of America attained a considerable skill in pharmacy, as is evidenced by a collection in our own possession, of stone mortars from prehistoric Kentucky tombs, and lava mortars employed in the processes of making remedies and face paints, from the habitations of the lost Arizona Mound Builders. In fact, the records of early man, everywhere, give evidence of some form of the practice of medicine, and the rudiments of pharmacy. Said the erudite Dr. Alexander Wilder, «Every country having a literature of ancient periods of its history, possesses some account of a healing art.»[6]

The early healing arts, among primitive peoples, were dominated by, or connected with religious rites, and consequently, with such, «the functions of the physician are usually united with those of the priest and civil ruler,»[7] to whom was relegated both the compounding and the administering of drugs. Ignorance and superstition led naturally to belief in sorcery, charms and witchcraft, as well as to confidence in the priest-physician, and faith in the wisdom of philosophers, astrologers, believers in divinations and the charm of soothsayers.[8] Hence we find the secondary meaning of the word φάρμακον to be sorcery, with which the primitive practice of medicine (and pharmacy) was often most intricately complicated, a practice exemplified to-day by belated people, for example, by the «pow-wow» methods of the American Indian «Medicine Man,» and the «Ordeal Tests» of the African. The separation of the duties of the physician, as we know him, from the offices of the priest or charm healer, came as a natural sequence to civilization's progress, and marks the first step in the development of the pharmacist.

Evolution of Pharmacy.— For a long period this process necessarily consisted of a picking out, or establishing, of remedial agents, and an excision of religious ceremony. By slow degrees, the sacred groves and pagan temples lost the confidence of the people as hospitals for the sick, and priests and mystics were no longer regarded as special physicians for disorders of the body. The magic touch of a love draught, or philter, the legendary «cry of the mandrake root,» the casting of the horoscope, the influence of metals, plants, constellations, the foreboding bad sign, and the acts of witches and wizards, these and such as these became severally less conspicuous, and were gradually eliminated from the domain of medicine. A majority of such remedial agents as were used even to the very door of the 19th century, were likewise destined to be displaced, including a multitude of loathsome mixtures and concoctions, such as preparations of vipers and toads, excrement, hog lice, dead creatures, selected parts of animal viscera, dead human beings, etc., etc. In the march of events, the alchemistic complexities of the Middle Ages, such as Van Helmont's «Amulet,» Albertus Magnus' «Elixir of Life,» the «Elixir Album,» «Elixir Rubrum,» and a multitude of elixirs of the Disciples of Hermetic Philosophy disappeared, as did also the numberless complex distillates and illogical compounds of mediæval Europe, a few of which, however, have left fragments of their skeletons, reclassified, to cumber our pharmacopœias. As examples of such lingering compounds that came thus to our doors may be cited «Elixir of Vitriol,» which gave us aromatic sulphuric acid; «Elixir Salutis,» which gave us compound tincture of senna; «Elixir Proprietatis,» which gave us compound tincture of aloes; «Elixir Stomachicum,» which gave us compound tincture of gentian; «Elixir Sacrum,» which gave us tincture of rhubarb and aloes. Taken as a whole, we perceive in the history of pharmaco-medicine a mighty struggle or turmoil through the passing ages, amidst which reason gradually took the place of both fancy and faith, and in which the action of definite drugs replaced charm, superstition, and the attractive mystery of occultism. As a factor, as well as a shadowy actor in it all, is to be seen the growth of:

The Pharmacist.— Not until the 18th century had well passed into history, did the pharmacist appear as a distinct factor in his unhappy struggle for individuality. Into the field where religion, legend, superstition and medicine were commingled, the alchemists, those searchers for the «Alkahest,» the «Philosopher's Stone,» the «Quinta Essentia,» or «Soul of the Four Elements,» wedged themselves. Not only were these men destined to serve their parts in the birth of modern chemistry, but in the evolution of the pharmacist as well. Such as Paracelsus, Cagliostro, the healers by vegetables (Galenical pharmacy), the advocates of minerals (remedies originated by fire), each in turn combated for supremacy, while the votaries of sulphur (the «Home of the Spirit»), Mercury (the «connecting link between spirit and body»), the users of animal and vegetable nostrums, the believers in the doctrines of signatures, of charms, of mysticism and astrology, by turns deceived the people, and themselves as well, and racked and tortured humanity. Charlatanism was ever rampant; mystery, deception, fallacy and legend reigned supreme. Fact concerning both remedies and diseases dovetailed so closely into fancy, both of form and expression, as to mystify both the actors and beholders, and to distract the historian. But at last, as a result of this ordeal and struggle, the physician, freed largely from the realm of mysticism, became a self-existing entity. Yet, for a long period, he served a dual part, for he was both the giver and the maker of medicine, while the surgeon and the barber were still one. Now came a cry for the separation of the art of compounding from the art of prescribing medicine, but it is impossible, in a limited article, to locate with exactness the dates of the varying differentiations, inasmuch as the process has not been a uniform proceeding, so far as either periods or countries are concerned. Different countries moved separately, as indeed did different sections of the same country. Nor do they to-day parallel each other. There have been ebbs and flows in the march of civilization, and to these medicine has ever responded, and yet responds. For example, as early as the time of Aristotle,[7] the “physician” practised medicine, and the business of the “apothecary” consisted in “preparing and dispensing medicines”; and yet, not until 1754 did the code of the College of Physicians of Edinburg prohibit their Fellows and Licentiates from “keeping an Apothecary Shop.” In England, a still greater license prevailed in the selling of medicines, which were not infrequently carried by grocers as a part of their stock, until 1617, when it was by law enacted that “no grocer should keep an apothecary's shop, and no surgeon should sell medicines.” Even when the shop of the apothecary finally took a recognized place as a supply for medicine, the apothecary did more or less prescribing. This, proportionately, led to a degree of rivalry and even antagonism between physicians and apothecaries, an antagonism which had come down through the Middle Ages and the 15th, 16th and 17th centuries, lasting even into the 19th century.[9] Finally, under the inroads of modern science and the higher ethics of the leading professional men of healing, the physician turned his attention more directly to therapy, while the coexisting barber and surgeon separated. Chemistry became a modern science, and pharmacy a recognized art, but one whose limits are even yet undefined, for never has the “apothecary” been regarded merely as a “collector or compounder of drugs.”

The latter part of the pharmacist's evolution may be graphically shown by a study of the successive issues of the European pharmacopeias, to which we may briefly allude. The first English pharmacopeia, issued (1618) by the College of Physicians, carried many curious mixtures and many cumbersome, ridiculous compounds. “Theriaca Andromachi,” containing 60 ingredients (one of them a preparation of vipers), and other prescriptions of similar complexity held place, even in the revision of 1650. But animal drugs and similar products were gradually relegated to obscurity, and finally, when chemistry became the master of alchemy, and the art of compounding became separate from the art of prescribing, mysticism practically vanished from the field of European pharmacy, leaving a number of pharmacopeias, each bearing modified relics of formulæ that had sifted to them from the past.[10]

American Pharmacy.— In the early practice of American medicine, remedies similar to those employed in England naturally prevailed. In our infancy, such works as the Dispensatory of Quincy, and the Dublin and Edinburgh dispensatories were conspicuous authorities. English text-books and English educational institutions, directly or indirectly, schooled the majority of American physicians. From them the professors in the American medical colleges drew their inspiration.* Familiar English compounds, such as Dover's Powder, James' Powder, Fowler's Solution, Elixir of Vitriol, Sweet Spirit of Niter, Hiera Picra, Black Drop, Laudanum, Paregoric, etc., were everywhere in evidence.

Early American pharmaceutical preparations, like the practice of American medicine, were thus but the outcome of the transplanted English art, which, as has been shown, was a conglomerate from out the siftings of mediæval Europe, which in turn had heired the remains of ancient sects and systems. As an example, although sassafras† and sarsaparilla were introduced into the Cordic Dispensatory, in 1592, American remedial agents were not taken seriously, even in America, until long after this date. American medicine, as well as therapy, were, until the opening of the 19th century, in the hands of the physician, who prescribed from his own stock of drugs. There is no evidence that a pharmacist, as now known, existed in America preceding the Revolution. The first American attempt at separating the two factors then vested in the physician, was made by Dr. John Morgan, of Philadelphia, in an address (30 May 1765), for which he was severely criticised for “trying to transplant into a new country, ideas that were suited only to continental practice.” [12] Not until 1774 did another physician write a prescription, when Dr. Abraham Chovert of Philadelphia presumed to make the innovation.

No author, no committee, even, ventured to issue an American pharmacopeia before 1778, at which date William Brown published at Lancaster, Pa.,[13] a little work of 32 pages for the use of the military hospital of Washington's army.‡ This was followed, 1808, by the Pharmacopœia of the Massachusetts Medical Society, and in 1820 by the first edition of the Pharmacopœia of the United States, which has since been revised each decade, although in 1830, owing to a split in the convention, two revisions appeared, one from New York, the other from Philadelphia. See PHARMACOPEIA.

The American Pharmaceutical Association, which met first in 1852, and continuously each year thereafter, excepting 1862, has been of invaluable service in advancing American pharmacy. To its endeavors may be added the influence of the State Pharmaceutical societies and their publications, as well as the many journals on pharmacy. The attention of observing physicians and botanists practising in rural American districts, and others, was finally drawn to the possibilities of the American flora, which was destined, eventually, to contribute its quota of remedial agents. Among the keen observers of that time may be mentioned B. S. Barton, Benjamin Rush, Manassch Cutler, Wm. Tully, C. S. Rafinesque, Jacob Bigelow, Robley

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* The first in America to teach medicine, including materia medica, pharmacy and pharmaceutical chemistry, was Dr. John Morgan, 1765, Philadelphia.

† The first American remedy introduced into Europe, about 1562. First described in detail by the Spanish physician, Monardes, of Sevilla, in 1754.[11]

‡ The Botanical treatises of Manasseh Cutler, 1785, and Schoepf, 1787, could scarcely be called *medical*.

Dunglison, Samuel Thomson, Stephen Elliott, Daniel Drake, Wooster Beach, R. E. Griffith, Wm. Zollicoffer, John King and numerous others.

In the first half of the 19th century the Thomsonian and Eclectic schools of medicine arose, whose efforts were conspicuously devoted to the study of American vegetable products and the suppression of cruelty in medication, such as blistering, bleeding, salivation and the use of depleting energetics. In 1821, the Philadelphia College of Pharmacy was instituted, while the New York College of Pharmacy opened in 1829. *The Journal of the Philadelphia College of Pharmacy* (the first journal on pharmacy in the English language), appeared in 1825, and the *American Druggists' Circular* in 1857, to be followed by a number of journals on pharmacy, now current. A power in themselves, great has been their influence.

These separated and often antagonistic factors led to a remarkable interest in American medicines, which was furthered by the rivalries both of the American schools in medicine, and by the sects and factions practising medicine in America, from which must not be excluded those using «Domestic Medicine,» as well as the «hydropaths» and the so-called «Indian Doctors.» About this period (middle of the 19th century), pharmacists began to give their attention more liberally to remedies that were increasingly American, while simple preparations, equally as effective but more pleasant, were devised to replace the more complex Pharmacopœial mixtures. The «Compound Tinctures» (the elixirs of old), «Compound Powders,» etc., were largely displaced by fluid extracts, and simple tinctures, while the great class of foreign confections or conserves, the numerous treacle mixtures, the many electuaries, the distilled waters of herbs and mixtures of herbs, familiar in European Pharmacopœias, also mostly disappeared.

Let us now briefly consider this evolution of medicinal products in its connection with the practice of American medicine, for medicine and pharmacy are inseparable. Until the middle of the 19th century, remedies nasty and violent were not only prevalent, but were prescribed in heroic doses. The public, as well as the medical profession, had been taught to consider desirable drug action as necessarily connected with systemic shock. Pharmaceutical preparations, as well as dosage, were such as usually violated the patient's conception of pleasure, rest and peace. Distasteful decoctions and concoctions, salivating mercurials, violent emetics, blisters and escharotics, bleeding and torturing mechanical processes, were conspicuous. This condition confronted pharmacy when Coxe's American Dispensatory appeared (1806), and the first edition of the Pharmacopeia, already mentioned (1820). No less was it a factor when appeared in 1833 the first edition of the 'Dispensatory of the United States,' fashioned like that of Coxe, after the European dispensatories, but yet evidencing a spirit of unrest and independence. Already had arisen in America a growing questioning of such methods of medication, a questioning that was fostered, if not instigated, by the attacks of the irregulars, the faddists, the various curers by secret mixtures, and independent agitators outside the medical profession, who, without much hope of success, and with no systematic plan, demanded reform, both in method and medicine. Their incipient attempt was first a questioning cry, next an energetic plea, then a demand for kindness to the sick. But these alike met the resistance of a body of physicians trained by the authority of centuries in the belief that disease was due to devils, as an invading entity, and that the devil must be fought by fire. The crusade that followed made Wooster Beach (see ECLECTICISM) and Samuel Thomson conspicuous. European drug conglomerates were finally bitterly and publicly assailed, as well as were the generally accepted methods of those who treated disease by such authority as reigned supreme, especially bleeding, blistering and mercurials. Thoughtful physicians likewise became imbued with a desire for new and more kindly agents to take the place of harsh and disagreeable remedies. All this gave both an incentive and an encouragement to pharmacists, and now it was that American substitutes for European remedies, both drugs and pharmaceutical preparations, began to creep into conspicuity. The resultant more elegant pharmaceutical preparations and more direct remedies led also to simplicity of medication, that was fortified by the discovery of a few proximate principles of plants. New processes and new classes of pharmaceutical preparations now began to prevail, on pharmacopœial authority.

As in medicine, so in pharmacy. The reform began in the early part of the 19th century with the application of the process of percolation to powdered drugs, suggested by Count Real in 1815, and adopted by Roullay Brothers, Paris, France, 1837. This process took deep root in America, and owing chiefly to the impetus given the subject by the French pharmacist, Duhamel, in his paper republished in the 'American Journal of Pharmacy' (1838), and to the efforts of Proctor, Graham, Parish, Squibb, and others, it was adopted in the 1840 Pharmacopœia, in making «Fluid Extracts.»

This new class of pharmaceutical preparations, the «Fluid Extracts,» was a great improvement on the decoctions, infusions and common tinctures then so commonly employed. American manufacturing pharmacists and pharmaceutical factories now for the first time became a factor in pharmacy, and turned their attention to the cultivation of this promising field. By means of special studies, improved appliances, and expert manipulative talent, they accomplished more than could have been expected of the circumscribed apothecary, of endless cares, limited opportunities, and innumerable shop diversions. Factory-made, sugar-coated pills were introduced (followers of French coated *drages*), and attained a wonderful popularity (1860 to 1880). These were closely followed by gelatine coated pills (known long previously, but nearly forgotten), and under the force of these machine-made products and their numberless combinations, the art of extemporaneous pill-making by prescription, practically disappeared from the realm of the American pharmacist. Then came factory-made, empty, gelatine capsules for encasing powders and masses, and finally, at the close of the 19th century, with a rush, came mechanical tablets of various fancy colors and designs carrying divided amounts of drugs, and stamped into a variety of pleasing forms. These being advertised to physicians, largely brushed aside the prescription-made powders of the apothecary. Trade emulsions and trademarked specialties also took a place in medication, while elixirs (1860 to 1875) in the way of sweetened and aromatized liquids. arose in numberless combinations to help the manufacturer in his aggressive inroads. The Eclectic School of Medicine felt the touch of the times, and turned its attention to the evolving of remedies more effective and more pleasant than were the very disagreeable early Eclectic products. The first edition of King's 'American Dispensatory' (1852), had been a great factor in correlating and somewhat simplifying Eclectic preparations, after which Scudder's aggressive attacks on the complex (shot-gun processes) in Eclectic medicine, and his plea in behalf of kindlier, more effective and more pleasant remedies, established the reformation. The heroic methods of Samuel Thomson were likewise abandoned by his followers (now known as the Physio-Medical school), until the past harshness of Thomsonian practice contrasts with their present methods, about as favorably as does the evolution in the Eclectic school. Notwithstanding ridicule and sarcasm of the «Regular» medical profession, the pleasant granules and dilutions of Homœopathy found favor with the public, and although of European origin, found a fertile and responsive field in America, serving American pharmacy and medication even more than its disciples appreciate, or its antagonists concede. The inroad of these discordant factors came between 1820 and the century's close. With increasing rapidity they followed each other, and together led to a brushing out of the disagreeable *old*, and its replacement with a more pleasant *new*.

Looking back over this period, one perceives, mainly, the bitterness of rivals and antagonists, the calumnies and attacks of individuals, the contentions of sects in medicine, and of factions in pharmacy. But this discord of the factors was accompanied by a harmonious movement of the whole, in which pharmacy and medicine were slowly uplifted, and by which the people have surely benefited.

The Present in Pharmacy.— Contrasted with half a century ago, the art of pharmacy in America is scarcely to be recognized by either the constituents of physicians' prescriptions, or by classes of pharmaceutical preparations. True, the Pharmacopeia still gives place to tinctures, syrups, pills, decoctions, infusions, etc., while old style bottles still cumber the pharmacists' shelves, but in practice the remedial preparations of the last century are no longer supreme, and many drugs then deemed vital are obsolete. Bitter has been the crusade that resulted in their displacement, a revolution has it been, largely to be credited to the factors that America has evolved and fostered, since she arose to take an active, critical part in the evolution of modern pharmacy.

At present, the evolution of pharmaceutical plant preparations is increasingly teaching that, in their natural settings, they constitute classes of substances that cannot be wholly paralleled by isolated constituents. In their interstructural forms and relationships, plant constituents are, as a class, colloidal or amorphous. It is now becoming apparent that the science of pharmaceutical chemistry applied to the vegetable kingdom demands the closest investigation of colloidal attributes, and of connected, catalytic affinities. A pronounced feature in alkaloidal problems is the discovery (by John Uri Lloyd), that colloidal hydrous aluminum silicate has a special affinity for all alkaloids. This affinity is considered as an adhesion attraction, the compounds of even the bitter alkaloids, such as strychnine, being tasteless or nearly so. These compounds have the remarkable quality of retaining their integrity in the presence of dilute (aqueous) acids, while dilute alkalies liberate the alkaloids from combination. This fact enables physicians to administer freely alkaloids that, uncombined, would disturb the stomach, because in the acid gastric juice, the alkaloid is inert. As an example may be mentioned the emetic alkaloids of ipecac, chief of which is emetine, that in this combination have no nauseating qualities.

An American «pharmacy» (drug store) now embraces not only medicines, but many foreign substances which permit of profit. The country drug store carries a miscellaneous assortment of nearly every description, even, at times, including groceries, wall paper, paints, glass and oils. In our cities the past 50 years have, as a rule, excluded oils, paints and glass from the pharmacist's province, but have introduced candies, fancy soda beverages, and many similar substances fully as foreign to medicine. Prescriptions are to a less degree than formerly compounded from preparations prepared by the pharmacist, factory-made products being favored by physicians to a great extent, and increasingly. Ready made specialties for the self-cure of disease are becoming familiar to the public, who purchase tablets and pills of active drugs so freely, as increasingly to breed harmful drug habits, a wrong that now receives the urgent attention of lawmakers and philanthropists. The past decade has brought from Germany a number of patented, copyrighted and trademarked synthetics, introduced first to the medical profession, who prescribed them by name. Thus they became known to the laity, who soon became self-prescribers of energetic remedies, such as the hazardous heart depressants, whose employment is not without risk, even under the watchful eye of a physician. This pernicious effect of over-drugging by these substances, as well as by the narcotics of old, has perhaps led an increasing class of citizens to discard all remedies, and to discredit all physicians, their beliefs reminding one of the healers of the far distant past, when the Church cared for both spiritual and temporal ailments. And lastly, may be briefly noted the introduction of animal extracts, anti-toxins and serums, which came at the very close of the 19th century. Within recent years, these animal products have claimed the attention of many physicians, the long established animal digestive agents, pepsin and pancreatin being well-known examples. Prolific sources of supply of such as these are the slaughter-houses of America, from which come an extensive line of crude products, once considered as «offal,» but now offered in good faith to manufacturers of pharmaceutical products, for utilization in the direction of serums and vaccines. The following is a list of «animal glands" recently offered by a reputable packing company: Parathyroid glands, pectoral glands, sheep thyroids, inguinal glands. precrural lymph glands, prescapular glands, mammary glands, pancreas glands or liver sweetbreads, posterior sublingual, pineal glands, hog ovaries, calf thyroids, stomach linings for pepsin, calf thyroid glands, beef thyroids, suprarenal glands, sheep thymus glands, reto-pharyngeal glands, calf thymus or throat sweetbreads, pituitary glands, beef thymus gland or throat sweetbreads, anterior sublingual, beef ovary glands, hog thyroids, sheep ovaries, "or any other pharmaceutical preparations in our line."

All these conspiring influences together with annoying State pharmacy laws, and the inroads of cut-rate druggists and aggressive department stores, have no doubt harassed the dispensing pharmacist. And yet, the literature of pharmacy to-day is the most extensive in all its record, the latest edition of the Pharmacopeia of the United States is superior to anything that has preceded, and pharmaceutical education is the most comprehensive and exacting in all American history.

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The author is indebted to the Lloyd Library for the data on which this paper is based. The titles of Pharmacopœias and Materia Medicas, numbering several hundred, in this collection, need not be given, but it is desirable that a few volumes concerning the historical record be referred to by consecutive text numbers. These are as follows:

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6. Wilder, 'History of Medicine,' New Salem, Me., 1901.
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11. Lloyd, 'Historical Story of Sassafras,' Chicago 1898.
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PHARNACES, fär'nạ-sēz, king of Pontus, son of Mithridates the Great. He usurped the throne of his father, who was compelled to commit suicide, 63 B.C., and by friendly embassies to Pompey enjoyed for a time the friendship of Rome. The civil war between Cæsar and Pompey tempted him to make an effort to extend his territory, thereby bringing on a war with Rome. For a time he was successful, capturing Colchis and Armenia, but Cæsar himself met him near Zela (47 B.C.), utterly routed his armies, and sent to Rome the famous message, "Veni, vidi, vici." Reports conflict concerning the fate of Pharnaces, some accounts having him slain by his son-in-law, Asander, while others make him die in captivity.

PHAROS, an island off the coast of Egypt opposite Rakotis. The island was connected with the mainland by Alexander the Great, who constructed the famous mole known as the Heptastadium. At the entrance of the greater harbor Ptolemy I engaged Sostratus of Cnidus to erect a great lighthouse, which was brought to completion under Ptolemy Philadelphus. This huge tower had a square base 100 feet to the side and a beacon fire was maintained at the summit. It ranked as one of the wonders of the ancient world but there are evident exaggerations as to its height and other dimensions. On 7 Aug. 1303 this lighthouse, long known as the Pharos of Alexandria, was partially destroyed by an earthquake, and its ruin was completed about 1346. Subsequently the stone was used in the construction of the fort Kaït Baï. Consult Tübker, 'Reallexikon des klassischen Altertums' (Vol. II, 8th ed., Leipzig 1914).

PHARSALIA, fär-să'lĭ-ą, the name given to the northermost section of the great plains of southern Thessaly, whose principal city is Pharsalus (q.v.). The name of the district is sometimes applied to the battle, better known as that of Pharsalus; and served Lucan (q.v.) as the title for his republican epic glorifying Cato and the other opponents of Cæsar, many of whom were killed in that battle.

PHARSALUS, fär-sā'lŭs (now FERSALA in Greek; CHATALJA in Turkish), city of southern Thessaly on the Enipeus, south of Larissa. A town of considerable antiquity with fortifications commanding the important defiles of the Othrys, one of the gateways of northern Greece, it played no part in Greek history, but was the scene of a Roman victory over Philip V of Macedon in 196, and in 48 B.C. (9 August, or possibly 6 June), of the complete defeat of Pompey (q.v.) by Julius Cæsar (q.v.), the beginning of the end of republican Rome. In 1881 Pharsalus became a part of Greece through cession, with Thessaly, by the Turks. In the war between Greece and Turkey the Greeks were defeated near this town 5 May 1897, and the Turks occupied it the next day. Since 1900 the city has been the seat of two Roman Catholic sees: Phanarus and Thessaliotides.

PHARYNGITIS, inflammation of the mucous membrane which lines the pharynx (q.v.). See NOSE AND THROAT, DISEASES OF.

PHARYNX, the region included in the back part of the mouth and upper portion of the throat. The pharynx is a funnel-shaped elastic pouch-like passage, about four inches in length, connecting the cavities of the mouth and nose with the œsophagus and the larynx. In repose the pharynx is continuously open for the passage of air to and from the lungs. During the act of swallowing, the pharynx is closed by its muscular fibres to impel the food toward the stomach. As a whole, it is attached superiorly to the basilar process of the occipital bone. Its broadest part lies opposite the hyoid bone. Its lowest boundary is at the cricoid cartilage of the larynx, that is, about the level of the fifth cervical vertebra, where it passes into and becomes continuous with the narrower œsophagus or «gullet.» It is loosely attached behind to the bodies of the cervical vertebræ by areolar tissue destitute of fatty elements.

The pharynx is composed of three coats — the inner being the mucous layer, the middle a fibrous coat, and the outer a muscular layer. The muscular coat is composed of various distinct muscles, chief among which are the three constrictor muscles of each side. The inferior constrictor arises from the sides of the cricoid and thyroid cartilages; the middle constrictor takes origin from the great cornu or horn of the hyoid bone, from the lesser cornu, and from part of the stylo-hyoid ligament; while the superior constrictor, situated at the upper part of the pharynx, arises from the hamular process of the sphenoid bone. All of these muscles are inserted into the middle line of the pharynx. The stylo-pharyngeal muscle of each side arises from the inner aspect of the base of the styloid process. The constrictor muscles of the pharynx contract upon food and cause it to pass downward to the œsophagus, the action of the stylo-pharyngei muscles being to draw the sides of the pharynx outward and upward and so to widen the cavity for the reception of food from the base of the tongue. The pharynx forms only part of the mechanism connected with swallowing the tongue and the palate (q.v.) and its arches and muscles being also intimately concerned in the process. The pharynx is also concerned in the modulation of the voice.

The pharynx is commonly considered as of two general parts: The nasal, or nasopharynx — that part above the plane of the soft palate; and the oral, or oropharynx — that part below the soft palate. Some anatomists divide the oropharynx into a middle section to which they limit that name, and the laryngopharynx, the section lying next to the larynx.

Seven apertures open into the pharynx: The two Eustachian tubes of the ear; the two posterior nares or hinder openings of the nostrils; the single aperture opening backward from the mouth, termed the isthmus facium; the cordiform or heart-shaped opening of the larynx, guarded by the epiglotis; and the opening of the œsophagus, into which the pharynx itself is continued. See Adenoids; Alimentary System; Brain; Digestion; Nose and Throat.

PHASCOLOGALE, făs-kō-lō gá-lē, or «pouched mouse,» a genus of small marsupials, differing from the dasyures in their dentition, which is on the insectivorous order; found throughout Australia, New Guinea and the Aru Islands. They bear some resemblance to rats, but are usually much smaller. The muzzle is long and pointed, and the ears are somewhat rounded and nearly naked. The pouch is rudimentary, rarely more than a fold in the skin below the teats which range from 4 to 10 in number. The latter fact would indicate that they produce more young at a birth than any other marsupial. The hind feet have five toes and generally are broad with smooth soles. They feed on insects, and climb trees (except *P. virginiæ* of North Queensland) in order to get them. *P. penicillata,* or Tapoa Tafa, is one of the commonest species, and is a pretty little animal with a bushy tail. The four Papuan varieties are marked with a stripe. See Dasyure.

PHASE. See Electrical Terms.

PHASE, or **PHASIS,** *in astronomy,* one of the appearances noted as to the illumination of the moon in its passing from an unillumined state (dark moon) through that of a continually broadening crescent and gibbous stages to a complete orb (full moon), and back to a dark moon again. (See Moon). Similar phases are undergone by the planets whose orbits lie between that of the earth and the sun. Mars, though his orbit lies outside the earth's orbit, exhibits slight phases; when in opposition his disk is circular, at all other times it is gibbous. Saturn's rings, also, show limited phases.

PHASIS, fā'sĭs, in ancient geography, a navigable river of Colchis, 305 miles in length, rising in the mountains of Armenia, and forming a part of the boundary line between Colchis and Asia Minor. It is now called Rioni or Rion (q.v.), after one of its tributaries, the Rhion of antiquity. Near it pheasants were plentiful and their name, *Phasianus colchicus,* is derived from that of the river, *Phasiani* in Latin meaning «belonging to the Phasis.»

PHASMIDÆ, or «spectre insects,» «leaf insects,» and «walking sticks,» a family of orthopterous insects allied to the *Mantidæ,* and remarkable for their very close resemblance to the leaves, twigs, grass and lichen-covered bark in the midst of which they live. The family includes about 600 species, nearly all being natives of tropical and semi-tropical Asia, Africa and Australia. Only six genera are represented in the United States and only one species, *Diapheroma femorata,* in the eastern section. The others are to be found only in the south and southwest. They are all vegetable feeders in which they differ from the *Mantidæ.* Some of them are destitute of wings, and have the appearance of dead twigs, while the motionless attitudes they assume add to the deception. In others, as the genus *Phyllium,* the wings have the appearance of withered leaves, while the brighter hue of the wing-covers of a few of larger size give to the animal the appearance of a fresher leaf. An interesting peculiarity of these insects is their ability to reproduce a lost limb in the succeeding molt, provided the joint next the body was not severed. See Leaf-Insect; Mimicry in Animals; Walking-Stick Insect.

PHEASANT, the common appellation of a group of magnificent gallinaceous birds generally considered to constitute a family (*Phasianidæ*). There are 20 genera included, with over 100 species. The name is an Anglicized form of the Latin *Phasianus.* The upper mandible is arched, overhangs the lower at the tip, and is naked at its base; the nostrils are placed at the base of the mandible, and are covered by a scale. The cheeks, region about the eyes, and often other parts of the head are naked and often provided with fleshy outgrowths, [illegible] themselves in [illegible] part of the United States [illegible] to the [illegible] The [illegible]

[illegible] (Chrysolophus) [illegible] of pheasants [illegible] remarkably [illegible] special modifications of [illegible] with [illegible] The [illegible] (C. pictus) of eastern Tibet and southern China is [illegible] colored scarlet, blue, black and yellow, and having a [illegible] golden erectile crest on the head. The Lady Amherst pheasant (C. amherstiae) is one of the most [illegible] and among the largest, reaching 50 inches in length and exhibiting golden, yellow, [illegible], russet and crimson shades. It succeeds well in confinement. The silver pheasant of Indo-China and the lower Himalayas (Gennaeus nycthemerus) belongs to the Kalij (Gennaeus) group. It possesses a generally silver-white [illegible] the feathers being marked by [illegible] black lines, the under parts are [illegible]. The tragopan or horned pheasant [illegible] found in the Himalayas [illegible] nearly the [illegible] the males of this species possess [illegible] horn-like processes [illegible] striking color. The [illegible] with white spots [illegible] brown. The habitat [illegible] is the high Himalayan forests [illegible] feet elevation. The argus [illegible] (Argusianus argus) [illegible] the peacocks (Pavo) [illegible] in Sumatra and the Malay peninsula. The [illegible] six feet from the [illegible] beak to the extremity of the tail [illegible] beautiful, the [illegible] wings being each [illegible] ocellated or eye-like spots [illegible] metallic hues. The general body plumage [illegible]. The [illegible] is [illegible] the secondary feathers, [illegible] assist these birds in [illegible] somewhat similar eye-spots [illegible] is the peacock pheasant (Polyplectron).

[illegible] pheasant ([illegible]) also belongs in this group, and [illegible] the pheasants, being 84 inches [illegible] tail measures 60 [illegible] pheasant (Ithaginis) is a native [illegible] even higher elevations [illegible] from 10,000 to 14,000 feet [illegible] bright grass-green [illegible] female, brown. The eared pheasant [illegible] is another species of the [illegible] Himalayas [illegible] become extremely [illegible] out of the [illegible] for [illegible] pheasant is another [illegible] the lower levels [illegible] elegant [illegible] laced with black and pale blue. [illegible] pheasant, a native of central Asia, is a [illegible] bird, 75 inches in length, with [illegible] white tail barred with black. It has [illegible] coverts, and also [illegible] in the United States. It is regarded as [illegible] of the pheasants, flying [illegible] with great swiftness. Other pheasants [illegible] are the [illegible] (Lophura) [illegible] and Malaysia, the [illegible] pheasant (Pucrasia) from [illegible] Afghanistan. The [illegible] (Lophophorus) [illegible] South Kashmir [illegible] of the same genus inhabit the Himalayas are of surpassing beauty, [illegible] metallic [illegible] colors, [illegible] silvery white and velvety [illegible]. The jungle fowl (Gallus), from which [illegible] fowls are [illegible] descended [illegible] of the pheasant group. So also [illegible] parts of the United [illegible] the [illegible] is erroneously known [illegible] the name of [illegible]. The turkeys [illegible] to the [illegible] aviary [illegible]

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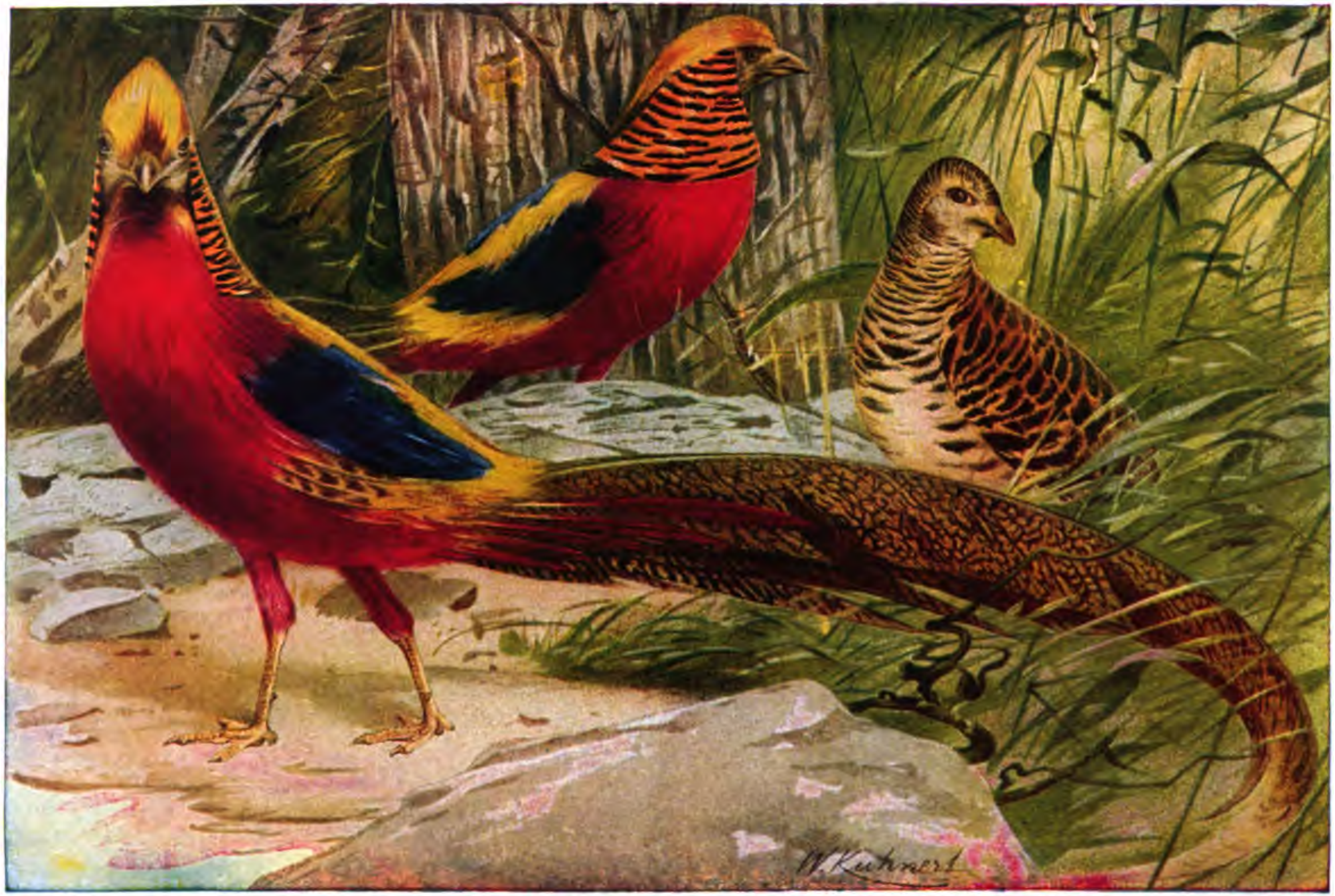

GOLDEN PHEASANT

The wings are short; the tail long, wedge-shaped, and consisting of 18 to 32 feathers, but with its coverts often presenting a remarkable development. The three front toes are united by a membrane up to the first joint, and the hinder toe is articulated to the tarsus. The males possess horny tarsal spurs. The food consists of grains, soft herbage, roots and insects. Pheasants are chiefly terrestrial in habits, taking short, rapid flights when alarmed. They are polygamous, the males and females consorting promiscuously together during the breeding-time, which occurs in spring. The simple nest is commonly formed amid long grass or bushes, and the female performs the entire duties of incubation. No true pheasants are indigenous to America, but all of the genera and species belong to Asia and are particularly represented in India and Indo-China. The English ring-necked pheasant, which is a familiar bird in this country, having been introduced into pheasantries and preserves, is a hybrid between the ring-necked pheasant (*Phasianus torquatus*), imported from China about a century ago, and *P. colchicus,* which is supposed to have been brought to Great Britain by the Romans, but may have been native. This pheasant is found throughout southern Europe, and was known to the ancient Greeks and Romans; Jason is reported to have brought it from Colchis in the famous ship *Argo*. The English pheasant often has also blood of *P. versicolor* and the plumage varies accordingly.

These birds breed freely in a domesticated state. The pheasant will interbreed with the common fowl, the Guinea fowl, and even with the black grouse; and there are white and pied varieties of the common species. The hybrid produced by the union of a cock-pheasant with the common hen is termed a *pero*. The female pheasants when old may, like pea-fowl, assume the feathers and general plumage of the males.

The pheasant is a famous game-bird in England and parts of the Continent. Great numbers are reared and fed artificially, and liberated in selected coverts on English estates. Considerable numbers have been placed on preserves in certain parts of the United States; but, while these handsome birds undoubtedly add interest to the landscape, pheasant shooting cannot be commended as a sport; the birds are too tame. As practised in England it differs little from a slaughter of barnyard fowls.

The green pheasant of Japan (*P. versicolor*) and the copper pheasant of China (*P. soemmerringi*) have also been introduced into the United States. Many of the Asiatic species of pheasants, the males of which exhibit strikingly handsome colors or peculiar modifications of the plumage, are well-known objects in aviaries and fancy-poultry yards in this country. The golden pheasant (*Chrysolophus pictus*) of eastern Tibet and southern China is a beautiful species, colored scarlet, blue, black and yellow, and having a brilliant golden erectile crest borne on the head. The Lady Amherst pheasant (*C. Amherstiæ*) is one of the most brilliant and among the largest, reaching 50 inches in length and exhibiting golden yellow, orange, blue, russet and crimson shades. It succeeds well in confinement. The silver pheasant of Indo-China and the lower Himalayas (*Gennæus nycthemerus*) belongs to the Kalij (kaleege) group. It possesses a generally silver-white plumage, the feathers being marked by fine concentric black lines; the under parts are colored black. The tragopan or "horned" pheasant (*Tragopan satyra*), found in the Himalayas, approaches more nearly the domestic barnyard fowls. The males of this species possess peculiar bluish, fleshy, horn-like processes on the head, and wattles of a similar color. The male plumage is colored red with white spots, that of the females being brown. The habitat of the tragopan is the high Himalayan forests, from 7,000 to 12,000 feet elevation. The argus pheasant (*Argusianus argus*), included by some naturalists with the peacocks (*Pavoninæ*), is a large species found in Sumatra and the Indo-Malayan region. The males of this bird measure from five to six feet from the tip of the beak to the extremity of the tail. The plumage is exceedingly beautiful, the secondary quills of the wings being each adorned with a series of ocellated or eye-like spots of brilliant metallic hues. The general body plumage is colored brown. The flight is feeble, owing to the length of the secondary feathers, which latter, however, assist these birds in running. A bird of somewhat similar eye-spots found over the same region is the peacock pheasant (*Polyplectron*).

Reinhardt's argus pheasant (*Reinhardius ocellatus*) also belongs in this group, and is the largest of the pheasants, being 84 inches in length; of which the tail measures 60 inches. The Blood pheasant (*Ithaginis*) is a native of Tibet inhabiting even higher elevations than the Tragopan — from 10,000 to 14,000 feet altitudes. The male has bright grass-green plumage; the female, brown. The Eared pheasant (*Crossoptilon*) is another species of the high Himalayas. It readily becomes extremely tame, and promises to be one of the best for domestication. The Cheer pheasant is another Himalayan species frequenting the lower levels. Its colors are less striking but elegant — buff, barred with black and pale blue. Reeves' pheasant, a native of central Asia, is a very large bird, 75 inches in length, with a long white tail barred with black. It has been naturalized in English coverts, and also tested in the United States. It is regarded as the "gamest" of all the pheasants, flying readily and with great swiftness. Other pheasants often found in aviaries are the Firebacks (*Lophura*) of Cochin China and Malaysia, and the Koklass pheasant (*Pucrasia*) from the mountain region of Afghanistan. The gorgeous Impeyan pheasant or Moonal (*Lophophorus impeyanus*) is found in South Kashmir. This, and related species of the same genus inhabiting the Himalayas, are of surpassing beauty, with their crested heads and brilliant metallic greens, purples, golden and coppery colors, set off by patches of silvery white and velvety black. The Jungle Fowl (*Gallus*), from which our domestic fowls are doubtless descended, is a member of the pheasant group. So also is the Pea-fowl (q. v.). In parts of the United States the ruffed grouse is erroneously known under the name of "pheasant." The turkeys belong to a family closely related to the pheasants, which they represent in the native avifauna of America.

The first successful introduction of pheasants into the United States was in 1880–81 by Hon. O. N. Denny, then consul-general at

[illegible] yellow. [illegible] reaching [illegible] inches [illegible] belongs to the [illegible] genus. It possesses a generally [illegible]-white

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[illegible] (Reeves[illegible]) [illegible] in this group and [illegible] 8 inches [illegible] measures (a) [illegible] is a native [illegible] higher elevations [illegible] species [illegible] lower [illegible] and elegant [illegible] black and pale blue [illegible] central Asia, is a [illegible] 7 inches in [illegible] tail [illegible] black. [illegible] and also [illegible] United States. It is regarded [illegible] Makh[illegible] The [illegible] Moorcroft [illegible] Kashmir. [illegible] of the same genus inhabiting the Himalayas, one of surpassing beauty, with [illegible] metallic greens, [illegible] and copper colors, set off by [illegible] silvery white and velvety black [illegible] (Gallus), from which our [illegible] are doubtless descended, is a member of the pheasant group. So also is [illegible] In parts of the United States the [illegible] is erroneously known under the name of "[illegible]." The turkeys belong [illegible] related to the pheasants, which they represent in the native avifauna of America.

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Shanghai, China. He selected the native ring-necked pheasants and in two importations succeeded in landing alive 22 cocks and 20 hens. These birds were liberated in the Willamette Valley, in Oregon, and prospered exceedingly In 1892 an open season of 10 weeks was declared, and it was reported that the first day's shooting netted 50,000 birds. This experience aroused a demand from all parts of the country for breeding stock, and pheasantries multiplied throughout Oregon. In 1899 alone shipments of breeding birds were made to 509 different localities, from Alaska to Mexico. The greater part of these experiments failed utterly, but the birds have flourished in Oregon, Washington and British Columbia. Consult Barton, F. T., ‘Pheasants in Covert and Aviary’ (London 1912); Elliott, D. G., ‘Monograph of the Phasianidæ’ (2 vols., New York 1872); Tegetmeier, W. B., ‘Pheasants: their Natural History and Management’ (London 1897); United States Department of Agriculture, ‘Farmers' Bulletin 390’ (Washington 1910).

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PHEASANT'S EYE, a popular name for the garden Adonis flower (*Adonis æstivalis*). It is also used as a distinctive name for a particular group of hardy pinks. See PINKS.

PHÈDRE, fā'dr' (Phædra 1677) was the last tragedy written for public performance by Jean Racine and shows his dramatic method in its highest development. He gave it the first place among his tragedies. Boileau agreed with him. Votaire thought Phædra's rôle "the finest ever put on the stage in any language." Yet its immediate success was bitterly contested, as that of some of his other plays had already been, by a court cabal directed by the Duchess de Bouillon. Pradon's insignificant ‘Phèdre et Hyppolyte’ was set up against it. There was a lively war of sonnets, too, in which Racine's friend Boileau had the better part. Old scandals were revamped, and matters grew so embittered that only the intervention of Condé saved Racine from prosecution on a trumped-up charge of corruption of public morals. With the subsidence of personal piques and passions ‘Phèdre’ was recognized as a masterpiece and has engaged the talent of a long series of great actresses to this day. The theme is that of the exquisite ‘Hippolytus’ of Euripides and the declamatory ‘Phædra,’ or ‘Hippolytus,’ of Seneca. Comparison well illustrates the Greek and the Roman practice in tragedy and the French classical tradition. But in ‘Phèdre,’ as in no other French drama, the analysis of passion is so wrought as to produce not merely Aristotle's purgation by moral fear but also by psychic terror at the victims' powerlessness to contend against what she knows to be sin, against "Venus clinging utterly to her prey" (line 306). Racine thus wholly changes the ethical bearings of the situation. He brings into it a Christian conviction and something of the peculiarly Jansenist theory of the powerlessness of the human will without prevenient divine grace, which was then deeply engaging his interest and that of Church and court in France. This gives to his treatment of the characters in the play a distinct modernity. Greek feelings and ideas are so deftly mingled with the modern that this heroine of ancient legend seems, in Chateaubriand's phrase, "the sinner fallen alive into the hands of God," to be pitied, though inexcusable.

Phædra, young bride of the aging Theseus, who has left her at Troezen, finds herself truly sick of love for his son Hippolytus, votary of the chaste huntress Diana and cold to her advances. Her "shameful grief" is thus further inflamed. She knows it to be criminal, but finds no power in herself to resist "all the furies of love" which drag her, the woman scorned, through desire of death and fear for her good name, to frantic resolve of jealous vengeance. Calumniating the son to the father, she leads Theseus to will and effect the death of Hippolytus, whose strange fate is recounted in the famous *récit de Theramène,* a stock declamation piece in France (lines 1498–1570). Phædra in terrified remorse confesses her fault. Her guilty confidante Oenone "has found in the sea too mild an expiation." She "exposing her penitence to all, will go down to the dead by a slower way," and ends her life by a poison of Medea's brewing.

Phèdre is edited with English Comments by Bué (London 1903), and Babbitt (Boston 1910); with French comments by Mesnard in ‘Oeuvres de J. Racine’ (Vol. III, 1865) and by Clouard in ‘Théâtre complet de Racine’ (Vol. III, 1912). Translated as ‘Phædra’ by Boswell in ‘Dramatic Works of Racine’ (London 1890), by Tickell and others. Consult Deltour, ‘Les Ennemis de Racine’ (pp. 331–368, Paris 1859).

BENJAMIN W. WELLS.

PHELAN, James Duval, American legislator: b. San Francisco, 20 April 1861. In 1881 he was graduated at Saint Ignatius College and studied law at the University of California. He was a commissioner and a vice-president of the World's Columbian Commission and after the San Francisco disaster of 1906 was president of the Relief and Red Cross funds; was designated by President Roosevelt to receive funds and was member of the committee of 50 and 40 for relief and reconstruction. He erected the largest office building in San Francisco after the fire. In 1896–1902 Mr. Phelan was mayor of San Francisco and in 1900 received a complimentary vote for United States senator in the California legislature. In 1913 President Wilson appointed him special commissioner to Europe to support his invitation to foreign countries to participate in the Panama-Pacific Exposition of 1915, and was also special commissioner to investigate the diplomatic complications arising in Santo Domingo in 1915. In 1914 he was elected to the United States Senate for the term 1915–21.

PHELAN, Richard, American Roman Catholic bishop: b. near Ballyragget, County Kilkenny, Ireland, 1 Jan. 1828; d. Idlewood, Pa., 20 Dec. 1904. He was educated in the College of Saint Kieran, Kilkenny; came to this country in 1850 attending first the old seminary of Saint Michaels, and subsequently spending three years in Saint Mary's Theological Seminary at Baltimore. Ordained to the priesthood in 1855 he was for four years a curate at Saint Paul's Cathedral at Pittsburgh, after which he served as pastor at Freeport, Pa., until 1868, when he was appointed pastor of Saint Peter's Church, Allegheny City. A new church which he built there at a cost of $150,000, regarded as perhaps the finest in Western Pennsylvania, was destroyed by fire just as Father Phelan was leaving for a new and higher appointment. He relinquished his elevation and remained with the charge until a new church had replaced the ruins of the former building. He served the diocese several times as administrator and in 1883 was made vicar-general. In 1885 he was consecrated coadjutor bishop of the two sees of Allegheny and Pittsburgh, succeeding to the full bishopric of Pittsburgh in December 1889.

PHELPS, Anson Greene, American merchant and philanthropist: b. Simsbury, Conn., 12 March 1781; d. New York, 30 Nov. 1853. He was by trade a saddler and at 18 established himself in business at Hartford, Conn., afterward owning a branch business at Charleston, S. C. In 1815 he removed to New York where he formed a partnership with Elisha Peck under the title of Phelps and Peck, dealing in tin plate and heavy metals. This house became the largest house in the metal trade in the United States. By the later addition of Mr. William E. Dodge, a recruit from the dry goods trade, the world famous house of Phelps, Dodge and Company was established. In 1845, Mr. Phelps bought a dam and surrounding lands on the Naugatuck River, Connecticut, and built a factory and some dwelling-houses; thus founding the town of Ansonia which was named for him. Out of this concern grew the great Ansonia Brass and Copper Company. Mr. Phelps amassed a large fortune, which was augmented by fortunate investments in real estate. His later years were spent in benevolent enterprises; he was president of the American Board of Commissioners for Foreign Missions; of the New York Asylum for the Blind: the Seaman's Friend Society; the Seamen's Bank for Savings; the American Tract Society, and the New York branch of the Colonization Society. His will bequeathed large sums to religious and charitable institutions.

PHELPS, Austin, American Congregational clergyman and author: b. West Brookfield, Mass., 7 Jan. 1820; d. Bar Harbor, Me., 13 Oct. 1890. He entered Hobart College, and after two years there went to Amherst and thence to the University of Pennsylvania where he was graduated at the head of his class in 1837. He studied theology first at the Union Theological Seminary in New York and later at the Yale Theological School; but having begun to preach, he was persistently urged before his course was completed to accept a pastorate. He continued his study, however, until 1842 when he accepted a call to the Pine Street Congregational Church, Boston. He remained pastor of this church until 1848 when he resigned to accept the chair of Homiletics and Sacred Rhetoric in Andover Theological Seminary. His health failing he resigned his professorship in 1879. He had also been president of the institution from 1869. The rest of his life was spent in retirement. His published works include 'The Still Hour' (1859), a book which was reprinted in many thousands abroad; 'The New Birth' (1867); 'Studies of the Old Testament' (1879); 'Theory and Practice of Preaching,' a much valued work (1881); 'Men and Books' (1882); 'English Style in Public Discourse' (1883); 'My Studies and Other Essays' (1886); 'My Note Book: Fragmentary Studies in Theology and Subjects Adjacent Thereto' (1889). He was, besides, a constant contributor to 'The Congregationalist,' and other religious periodicals. (See also PHELPS, ELIZABETH STUART). Consult 'Austin Phelps: A Memoir,' by Elizabeth Stuart Phelps-Ward (New York 1891).

PHELPS, Charles Edward, American soldier and jurist: b. Guilford, Vt., 1 May 1833; d. Baltimore, Md., 26 Dec. 1908. He was graduated from Princeton in 1852, from Harvard Law School in 1853, and established a law practice in Baltimore, Md. He was one of the founders of the Maryland Guard, serving first as captain and later as major. In 1862 he entered the Federal service as lieutenant-colonel in the 7th Maryland Volunteers, and was soon made colonel. He commanded a division of the Fifth Army Corps at Laurel Hill, where he was severely wounded. He was promoted to the rank of brevet brigadier-general of volunteers and was awarded a medal of honor for gallantry at the battles of the Wilderness and Spottsylvania. He was elected to Congress in 1864 and 1866, and in 1882 elected to the Supreme bench, Baltimore, for a 15-year term. Re-elected in 1897 for a like term, a special act of the legislature in 1902 permitting him to continue in office, though past the constitutional age limit. He was professor of law at the University of Maryland and wrote 'Phelps's Juridical Equity' (1894) and 'Falstaff and Equity' (1901).

PHELPS, Edward John, American diplomatist: b. Middlebury, Vt., 11 July 1822; d. New Haven, Conn., 9 March 1900. He was graduated at Middlebury College in 1840, and took up the study of law in the office of Horatio Seymour at Utica, finishing with a year at the Yale Law School; was admitted to the Vermont bar in 1843, and began practice at Middlebury, but in 1845 settled in Burlington, Vt. In 1851 he was appointed second comptroller of the treasury by President Fillmore and remained in the office through his administration. He was strongly opposed to the Civil War, was a member of the Vermont constitutional convention in 1870, and in 1881 was president of the American Bar Association, and in that year ran for governor of Vermont on the Democratic ticket but was defeated. In 1881 he was made Kent professor of law in the Yale Law School and also lecturer on constitutional law in Boston University. President Cleveland appointed him Minister to England 1885-89. In 1890 he was the Democratic candidate for United States senator in the Vermont legislature but failed of election. During the Bering Sea dispute in 1893 he was appointed by President Harrison senior counsel for the United States, after which he resumed his chair at Yale and continued there until his death. He wrote 'The Life and Character of Charles Linsley'; 'Orations and Essays' (published posthumously 1901), and a series of articles on the Constitution of the United States published in the *Nineteenth Century* in 1888.

PHELPS, Elizabeth Stuart ("H. TRUSTA"): American author: b. Andover, Mass., 13 Aug. 1815; d. Boston, Mass., 30 Nov. 1852. She was married to Austin Phelps (q.v.) in 1842 and subsequently devoted much attention to writing.

Her ‘Sunny Side’ (1851) reached a sale of over 100,000 in one year. Among her other works are the «Kitty Brown» series (1850); ‘The Angel over the Right Shoulder’ (1851); ‘A Peep at Number Five’ (1851); ‘The Tell-Tale’ (1852); ‘Little Mary’ (1853). and ‘The Last Sheaf from Sunny Side’ (published with a memorial by her husband 1853).

PHELPS, Elizabeth Stuart. See WARD, ELIZABETH STUART PHELPS.

PHELPS, John Wolcott, American soldier and abolitionist: b. Guilford Centre, Vt., 13 Nov. 1813; d. Brattleboro, Vt., 2 Feb. 1885. His progenitors for several generations were eminent lawyers He was graduated at West Point in 1836; entered the artillery and served against the Creeks and Seminoles, 1836–38. After this war he was in charge of the removal of the Cherokee Indians to the West. In the Mexican War he fought at Monterey, Vera Cruz, Cerro Gordo, Contreras, Molino del Rey, and City of Mexico, and was brevetted captain for gallant conduct, but declined a nominal promotion, and in 1850 received the regular promotion to that rank. He served along the Mexican border until 1852 when he went to Europe on a year's furlough. On his return he served under General Johnson in the Utah expedition. He resigned from the army in 1859, and devoted himself to writing vigorous and scholarly articles attacking the principle and practice of slavery. He enlisted in 1861 as colonel of the 1st Vermont Volunteers, was soon made brigadier-general, and was with Farragut in the lower Mississippi in April 1862. He occupied New Orleans 1 May 1862, and issued soon after a proclamation against slavery, which resulted in a reproof from General Butler. During his command of Camp Parapet, near New Orleans, the camp was thronged with escaped slaves and General Phelps began organizing them as troops. The government was not yet ready to accept this policy, and General Phelps was sharply rebuked, and ordered to use the negroes only for menial labor, the argument presented being that they were still slaves, and that slaves could not be soldiers. In August 1862 he was declared an outlaw by the Confederate government for having «organized and armed negro slaves.» Failing to make headway against continual opposition, he resigned and returned to Vermont. A few months later the government adopted his view, and began to organize negro regiments. and President Lincoln tendered him a commission as major-general in command of such troops. This, however, he declined. In Vermont he took a prominent part in educational work and in historical research, and was an eminent anti-Mason. He was nominated for the Presidency by the American (or Anti-Masonic) party in 1880. He opposed all secret societies, and in 1864 translated de la Hodde's ‘Sociétés secrètes de France’ under the title ‘The Cradle of Rebellions.’ He also wrote ‘Sibylline Leaves’ (1858); ‘Secret Societies, Ancient and Modern’ (1873): ‘History of Madagascar’ (1884), and contributed extensively to literary and scientific periodicals of the day. Consult biographical sketch by Howard, C. H. C. (Brattleboro, Vt., 1887).

PHELPS, Oliver, American merchant and land speculator: b. Windsor, Conn., 1749; d. Canandaigua, N. Y., 21 Feb. 1809. He was a merchant in Suffield, Conn., and from 1771 in Granville, Mass., and amassed a large fortune. In 1788 he formed a partnership with Nathaniel Gorham and purchased from the Commonwealth of Massachusetts its pre-emptive rights to a tract of 6,000,000 acres of land in New York for £300,000, to be paid for in «consolidated securities.» The land was within the charter limits of both New York and Massachusetts, but a compromise was effected whereby the sovereignty remained with New York and the ownership of the territory was ceded to Massachusetts by the Hartford convention of 1786. Phelps secured the Indian title to 2,600,000 acres of the land and opened at Canandaigua the first land office in the country. The rise in value of the «consolidated securities» made full payment impossible and Phelps relinquished to the State the portion of the land still unpaid for. In 1790 he sold to Robert Morris his remaining share, 2,100,000 acres, and in 1795, in partnership with several others, purchased from Connecticut 3,300,000 acres in Ohio, known as the Western Reserve. Later he sold his interest and returned to Canandaigua. He was the first judge of the county of Ontario, and was a member of Congress in 1803–05. He took an active interest in the Erie Canal and the Welland Canal, and for a time engaged in building steamboats on Cayuga Lake.

PHELPS, Samuel, English actor: b. Devonport, Devonshire, 13 Feb. 1804; d. near Epping, Essex, England, 6 Nov. 1878. He was employed as junior reader in the office of the *Plymouth Herald,* and later on the London *Globe* and *Sun*. For some time he belonged to a private amateur theatrical society of which Douglas Jerrold and William Edward Love were also members. In 1825 he made his public début as an amateur at the Olympic Theatre, later joining a circuit in which he achieved popular success. In 1837 he made his first appearance in London, in the character of Shylock, at the Haymarket Theatre and scored a success, appearing later in the same season with Macready in Covent Garden Theatre, alternating with him the rôles of Othello and Iago. He came rapidly to the front as an actor, rivaling Charles Kean in many Shakespearian roles. In partnership with Thomas Greenwood and Mrs. Warner he took the management of Sadler's Wells Theatre, Islington, in 1844, and there achieved a great success, extending over 20 years, and producing more than 30 of the plays of Shakespeare and other famous dramatists. He published an edition of Shakespeare in 1853. Consult Coleman, J., ‘Memoirs of Phelps’ (London 1886); Forbes-Robertson, J., ‘Life and Life-Work of Phelps’ (London 1886).

PHELPS, Thomas Stowell, American naval officer: b. Buckfield, Me., 2 Nov. 1822; d. New York, 10 Jan. 1901. He was graduated from the United States Naval Academy in 1846, served in the Mexican War, was engaged in the coast survey, and participated in the Indian War in Washington Territory in 1855–56. In 1858–59 he served on the Paraguay expedition as master, and later as lieutenant, and at the outbreak of the Civil War was in command of the coast survey steamer *Vixen,* engaged in making surveys of southern harbors. He joined the naval expedition for the relief of Fort Sumter and was actively employed in making the needed war charts of southern rivers and inlets, taking part in many skirmishes while carrying on his work. In 1862 he joined the North Atlantic squadron and participated in the Peninsula Campaign (q.v.). He was commissioned lieutenant-commander and took a creditable part in many engagements. In 1863 he was made commander of the *Corwin* and resumed the work of making charts for campaign purposes. In 1864 he distinguished himself at Fort Fisher, where he commanded the *Juanita*. He afterward served on the southern coast until 1867, when he was transferred to the California navy yard. In 1871 he was promoted to the rank of captain, and in 1879 to commodore. In 1881–82 he was commandant of the Mare Island navy yard and in 1883–84 commanded the South Atlantic, squadron. In 1884 he was made rear-admiral and was retired in that year, after 45 years of active service. He published 'Sailing Directions for the Straits of Magellan' (1855); and 'Reminiscences of Washington Territory' (1882).

PHELPS, William Lyon, American educator: b. New Haven, Conn., 2 Jan. 1865. He was graduated from Yale in 1887 and is now professor of English literature there. He is the author of 'The Beginnings of the English Romantic Movement' (1893); 'The Permanent Contribution of the 19th Century to English Literature' (1901); 'A Dash at the Pole' (1909); 'Essays on Modern Novelists' (1910); 'Essays on Russian Novelists' (1911); Teaching in School and College' (1812); 'Essays on Books' (1914); 'Browning, How to Know Him' (1915); 'The Advance of the English Novel' (1916); 'Archibald Marshall' (1918). He has also edited many editions of English classical authors. He is vice-president of the National Institute of Arts and Letters, member of the Authors Club, London, and president of the New Haven Symphony Orchestra. Mr. Phelps is also a well-known lecturer on literary subjects.

PHELPS, William Walter, American statesman and diplomat: b. New York, 24 Aug. 1839; d. Teaneck, N. J., 16 June 1894. He was graduated from Yale in 1860 and from the Columbia Law School in 1863, engaged in an extensive law practice as counsel for a number of banks and trust companies, and nine railroad companies. Upon the death of his father he withdrew from his general law practice and devoted his energies to the management of some large estates and the trusts connected with them. In 1872 he was elected member of Congress from New Jersey on the Republican ticket, and took an active part in the proceedings of that body, particularly on monetary questions. He was appointed Minister to Austria in 1881, resigned in the following year, and in 1882–88 was again in Congress for three consecutive terms. In 1889 he was one of three United States commissioners to the International Conference on the Samoan question, held in Berlin, and in 1889–93 was United States Minister to Berlin. In the latter year he was appointed judge of the New Jersey Court of Errors and Appeals, which office he resigned on account of failing health a few weeks before his death.

PHENACETIN, fĕ-năs'ĕ-tĭn, *in pharmacy,* $C_2H_5.O.C_6H_4.NH.COCH_3$, para-acet-phenetidin (acetphenetidin in the United States Pharmacopœia) is formed by the action of the strongest acetic acid on para-phenetidin, a body related to both aniline and phenetol. When crystallized from a water solution phenacetin forms colorless crystalline scales, odorless, tasteless, sparingly soluble in cold water, more so in hot water or alcohol. It has found extensive use as an antipyretic and an analgesic, being one of the least dangerous and most efficient drugs of its kind. It is a heart depressant, diminishing the action of the cardiac muscle. Frequently combined with caffeine when used for relief of headache, neuralgia, the pains of rheumatism, and the like. See ANALGESICS; ANTIPYRETICS.

PHENACITE, a transparent mineral, not unlike quartz, for which it may be easily mistaken, usually colorless, but sometimes tinted yellowish or wine-red. It possesses extraordinary hardness, 7.5 to 7.8, and yields gems of much brilliancy. It occurs in prismatic crystals often very large, up to one pound or more in weight, and also in lenticular form in Russia and Switzerland, also in the United States, with topaz at Topaz Butte (near Florissant), and on Mount Antero, Colorado. In lenticular form it is found with topaz on Bald Face Mountain near Chatham in New Hampshire, and in the mica mines of Amelia County, Virginia. It is a beryllium orthosilicate, with the symbol Be_2SiO_4 or $2\ BeO.SiO_2$ and the average composition: silica 54.45 per cent and glucina 45.55 per cent.

PHENACODUS, or **PHENACODON,** a typical perissodactylic representative of the early extinct, ungulate group *Condylarthra* (q.v.), whose well-preserved remains are recovered from the lowest strata of the Lower Eocene (Wasatch) formations of the central Rocky Mountain region. Two species are known — *P. primævus,* about as large as a tapir and *P. wortmanni,* smaller — that is, from five to six feet in length. The head was comparatively small and the brain-cavity relatively so and the brain itself small and smooth, the cerebellum uncovered and as large as the cerebrum. The halves of the lower jaw are not fused at the chin; the dentition is generalized; clavicles are absent; the hind limbs are much larger than the fore limbs and the feet are nearly plantigrade and five-toed. The terminal phalanges of the toes show that they did not bear claws but hoofs, with the axis passing through the third digit, foreshadowing the condition of the single-hoofed animals (horses). Consult Woodward J., 'Vertebrate Palæontology' (London 1898): Beddard, F. E., 'Mammalia' (London 1902).

PHENOL, or **CARBOLIC ACID,** C_6H_5OH, is the first member of a series of hydroxy compounds in which the hydroxyl group is directly attached to the nucleus. It was discovered by Runge in coal-tar, in 1834. The commercial product is obtained from this source by fractional distillation. The fraction containing carbolic acid is shaken with sufficient sodium hydroxide solution to form sodium phenate, which yields phenol when treated with carbon dioxide in the presence of a small quantity of sulphuric acid. For the manufacture of certain compounds, i.e., picric acid and for medicinal purposes, phenol is prepared synthetically by fusing dry sodium benzene sulphonate with caustic potash. The product is cooled, dissolved in water and acidified with HCl,H_2SO_4 or carbonic acid. Another synthetic process consists in the treatment of acidified aniline sulphate solution with the required quantity of sodium nitrite. The diazonium salt obtained in this reaction yields phenol when heated with water. The products in all these processes may be purified by distillation. Phenol has also been obtained by the distillation of crystallized salicylic acid, and by heating molecular proportions of chlorbenzene, sodium hydroxide and water to about 300° C. under pressure.

Phenol crystallizes in needles or prisms, melts at 42° C. and boils at 183° C. It is very soluble in glycerine, alcohol, ether, chloroform, benzene and to a limited extent in water, one part of phenol dissolving in 15 parts of water at 16° C.; the solubility increases with rise of temperature. The crystals of phenol are hygroscopic and liquefy in the presence of moisture. Under the influence of light or air the compound assumes a red color. According to recent investigations this is caused by minute traces of quinone or its derivatives. Chemically pure phenol has practically no action upon blue litmus paper, the red color imparted to blue litmus by phenol from coal-tar is evidently due to benzoic acid. The hydroxides of strong alkalies, halogens, nitric acid, sulphuric acid and other reagents readily react with phenol forming a number of derivatives.

Phenol finds wide application as a powerful antiseptic. Disinfecting powders or liquids contain a mixture of the compound with neutral substances like infusorial earth, tar-oil, etc. In the concentrated form phenol is a powerful irritant, coagulating albumin, destroying the mucous membrane and gradually paralyzing the higher tissues. Taken internally it acts as a fatal poison. Phenol is used on an extensive scale for the manufacture of picric acid, salicylic acid, phenacetin, phenolphthalein and other derivatives. It is an important intermediate in the dye industry; with benzotrichloride it forms benzaurine, with oxalic and sulphuric acids it condenses into coralline, with diazo-sulphanilic acid it is converted into Tropaeolin Y and with meta- and para-diamines it forms derivatives from which black dyes of the aniline-black series are obtained. The important commercial article, known as Bakelite, is manufactured by the condensation of Phenol with formaldehyde in the presence of a base. When this product is molded into the desired form and heated under pressure in the presence of a filling material like asbestos, rubber, casein, nitrocellulose, etc., it becomes insoluble, hard and sometimes infusible. Buttons, umbrella handles, insulators, tobacco pipes and many useful articles of commerce are manufactured from Bakelite. See also CARBOLIC ACID.

V. S. BABASINIAN,
Professor of Chemistry, Lihigh University.

PHENOL, Poisoning by. See TOXICOLOGY.

PHENYL, a monovalent radical with the symbol C_6H_5, entering into the composition of many organic substances, as benzene (phenylhydride); phenol (phenylhydroxyl); aniline (phenylamine), etc. It exists in the free state in diphenyl, in the combination $C_6H_5 — H_5C_6$.

PHERÆ, fē'rē, one of the most ancient cities of southeastern Thessaly, in the Pelasgiotis. It was situated in a fertile region and was surrounded by gardens and plantations and was 10 miles westerly from its harbor city of Pagasæ; both towns were intimately connected with the myth of Alcestis (q.v.) and Admetus, the son of Pheres, the founder of Pheræ and father of Emmelus who sailed with 11 ships from Pheræ and neighboring towns to take part in the Trojan War. In the early years of the 4th century B.C., toward the close of the Peloponnesian War, in which Pheræ had aided the Athenians, a tyranny was established here by Lycophron, whose son Jason succeeded him, became the practical master of all northern Greece and thus the forerunner of Philip and Alexander of Macedon and was assassinated in B.C. 374, by his brothers. They quarreled quickly; Polyphron killed Polydorus and was himself assassinated by his nephew Alexander in 369, who is remembered for his fiendish cruelties. But his reign was short; about 359 his wife Thebe and her brothers killed him. The government was continued by two of the brothers, Tisiphonus and Lycophron, successively. The latter was deposed by Philip of Macedon, who, after an unsuccessful experiment with democratic government at Pheræ, made it a part of the province of Thessaly. The ruins of Pheræ may still be traced near the modern town of Velestino.

PHERECYDES, fĕr-ĕ-sī'dēz, early Greek philosopher, probably belonging to the middle of the 6th century B.C. He was a native of the island of Syros (and is not to be confused with Pherecydes of Leros, 485–400 B.C., an Athenian historian, of whose works only fragments remain). His philosophy shows the influence of the Phœnicians and probably had an admixture also of the Egyptian and possibly included the doctrine of metempsychosis, or transmigration of souls. His great work, entitled 'Heptamychus' or 'Pentemychus,' a cosmogony based on the three elemental energies of Time, Earth and Æther; a curious blending of science and mythology. Cicero says that Pherecydes was the first Greek to teach the immortality of the soul. Pythagoras was his pupil, but it has not been established that the theory of the transmigration of souls, propounded by the latter, was a part of the philosophy of Pherecydes. Philo Judæus is reckoned among his followers. The few remains of his writing, in the Old Ionic dialect, are edited in Müller, K. O., 'Fragmenta Historicorum Græcorum' (Göttingen 1850); and the recently discovered 'Marriage of Zeus and Chthonia' in Grenfell, B. P., 'New Classical Fragments' (Oxford 1897).

PHI BETA KAPPA SOCIETY. See GREEK-LETTER SOCIETIES AND COLLEGE FRATERNITIES.

PHIDIAS, fĭd'ĭ-ạs, Greek sculptor: b. Athens, B.C. 498; d. there, B.C. 432; the age of Pericles. He was the son of Charmides, and a pupil of Hegias the Athenian and probably of Ageladas, the sculptor of Argos. He was first employed on public works by Cimon (q.v.) under whom he executed several statues at Delphi. The works of himself and his pupils were exceedingly numerous, and he is said to have executed three important statues of Minerva or Athene alone, all of which were standing in the time of Pausanias (175 A.D.). One colossal statue, «Athene Promachos,» that is, the champion, was of bronze, the metal for which was taken from the spoils of Marathon. It stood between the Parthenon and the Propylæum. Upon her shield, in rilievo, was wrought the battle of the Centaurs, from designs by Parrhasius. Near the statue stood an owl, the bird of Athene, goddess of wisdom. This statue towered so high on the Acropolis that mariners, doubling the promontory of Sunium, saw her helmet and her spear. The second of his most famous statues was made of ivory and gold. It was the Athene of the Parthenon or the temple of Parthenos, the virgin goddess, and was about 41½ English feet in height. This was the renowned chrysele-phantine statue, formed of wood overlaid with ivory. The arms were of gold, as was the peplos or garment, and the metal was either beaten or cast with such exquisite skill that this robe might be put off or on, and could be weighed by the treasurer of the temple. Thus the sculptor was enabled to refute the charge of peculation afterward made against him, and foreseen by Pericles who warned him to devise the removable garments. The gold weighed 44 talents. The eyes were of marble, painted according to the Homeric description of the blue-eyed goddess. The figure stood upright, ægis on breast and spear in hand. A serpent or dragon stood near it, supposed to be that of Ericthonius, one of the gods of the hill. In the right hand of the goddess was the figure of Victory, of ivory, with a vestment of gold, four cubits high. By her side stood the shield; on the convex side of which was carved the battle of the Titans. Phidias is said to have introduced portraits of himself and of Pericles in the Battle of the Amazons, one of the subjects carved upon this shield. The Olympian Zeus of Phidias was ranked for its majestic beauty among the wonders of the world. It was nearly 60 feet in height, including the throne and was regarded as the greatest of Greek sculptures. Zeus was here seen sitting upon a throne, with an olive wreath of gold about his temples; the upper part of his body was naked; a wide mantle covering the rest of it, hung down in folds to his feet, which rested on a footstool. The naked parts of the statue were of ivory, the dress was of beaten gold. In the right hand stood Victory facing the statue, and carved, like it, out of ivory and gold; she was holding out, as if offering to the deity a fillet of triumph. In his left hand Zeus held a sceptre, made of various metals skilfully joined, and on the sceptre an eagle had alighted. Power, wisdom and goodness were admirably expressed in his features. Cicero relates that the artist was led by a passage in the Iliad to conceive such a figure. The statue was surrounded and concealed by hanging tapestry, which was drawn aside only on particular occasions. This statue was removed to Constantinople by Theodosius I, and destroyed by fire in 475.

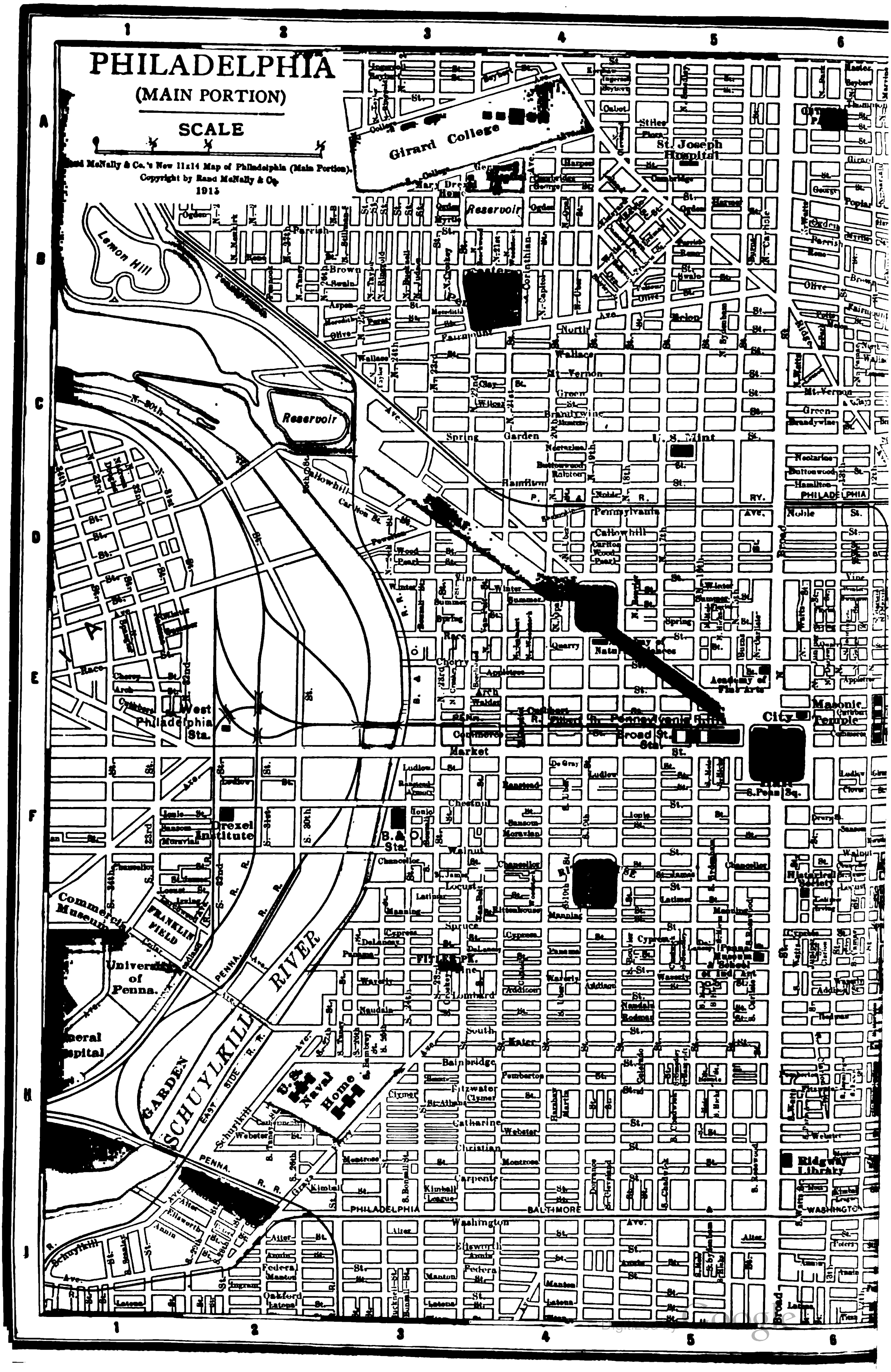
Phidias was, moreover, employed by Pericles as an architect, and by his genius Athens was made the most magnificent city in Greece. During the government of Pericles, which lasted 20 years, it was adorned with more temples, colonnades and works of art than Rome could boast the construction of in seven centuries. Materials and artists were abundant. Phidias superintended these improvements; and the sculptures with which the Acropolis was adorned were partly from his own hand and partly worked out by pupils in the spirit and after the ideas of this great master. While a number of existing statues are attributed to him none can be identified as positively of his own handiwork. The frieze of the Parthenon, of which only fragments remain, is generally regarded as his personal work. Phidias received great honors from the Athenians, but was subsequently accused first of peculation, which he successfully disproved; and then of impiety for putting his own likeness and that of Pericles on the shield of Athena. He died in prison, a martyr to his friendship with Pericles, on whom his persecutors aimed by this action to inflict suffering.

Consult Collignon, M., ‹Phidias› (Paris 1886); Gardner, E. A., ‹Six Greek Sculptors› (London 1910); Lechat, H., ‹Phidias et la Sculpture Grecque au Ve Siecle› (Paris 1906); Mueller, K. O., ‹Commentatio de Phidiae Vita et Operibus› (Göttingen 1827); Murray, A. S., ‹History of Greek Sculpture› (London 1890); Waldstein, C., ‹Art of Phidias› (Cambridge 1885):

PHIGALIAN (fĭ-gā'lĭ-ạn) **MARBLES**, a frieze from the temple of Apollo Epicurius at Bassæ, four miles from Phigalia in Arcadia, rediscovered by Bochor and by Chandler in 1765, when the temple was practically intact, having been nearly hidden by the vegetation of the mountain slopes below which it lies. The temple was unique in that its orientation was north and south, instead of east and west, and in that its frieze was on the inner walls of the cella, a circumstance which preserved it from weathering. The frieze comprised 23 marble blocks cut in high bas-relief, each two feet two and one-half inches high and forming complete a length of over 100 feet. It was purchased by the British government in 1814 for £15,000 and is now in the British Museum. Although the original design was evidently excellent, the workmanship shows many evidences of hasty execution at the hands of several different workmen. The subjects of the carvings were the battles of the Lapithæ and the Centaurs, and between the Amazons and the Greeks. The restoration of the temple, a Doric building, 125 by 46 feet, of yellowish limestone, has been undertaken by the Greek Archæological Society. Consult Cockerell, C. R., ‹The Temples of Jupiter Panhellenius at Ægina and Apollo Epicurius at Bassæ› (London 1860), and Smith, A. H., ‹Catalogue of the Sculptures in the Department of Greek and Roman Antiquities, British Museum› (London 1892).

PHILADELPHIA. See ALA-SHEHR.

PHILADELPHIA, Pa., the largest city in the State and the third largest in the United States, at the junction of the Delaware and Schuylkill rivers (Independence Hall, lat. 39° 56′ 57.5″ N., and long. 75° 8′ 54.75″ W.). The site was determined by the «Falls line,» which marks the limit to inland navigation on the Schuylkill and to navigation by deep-sea craft on the Delaware. Both sociological and natural causes combined to establish a centre of population between the Hudson and Chesapeake Bay



PHILADELPHIA
(MAIN PORTION)

Rand McNally & Co.'s New 11x14 Map of Philadelphia (Main Portion).
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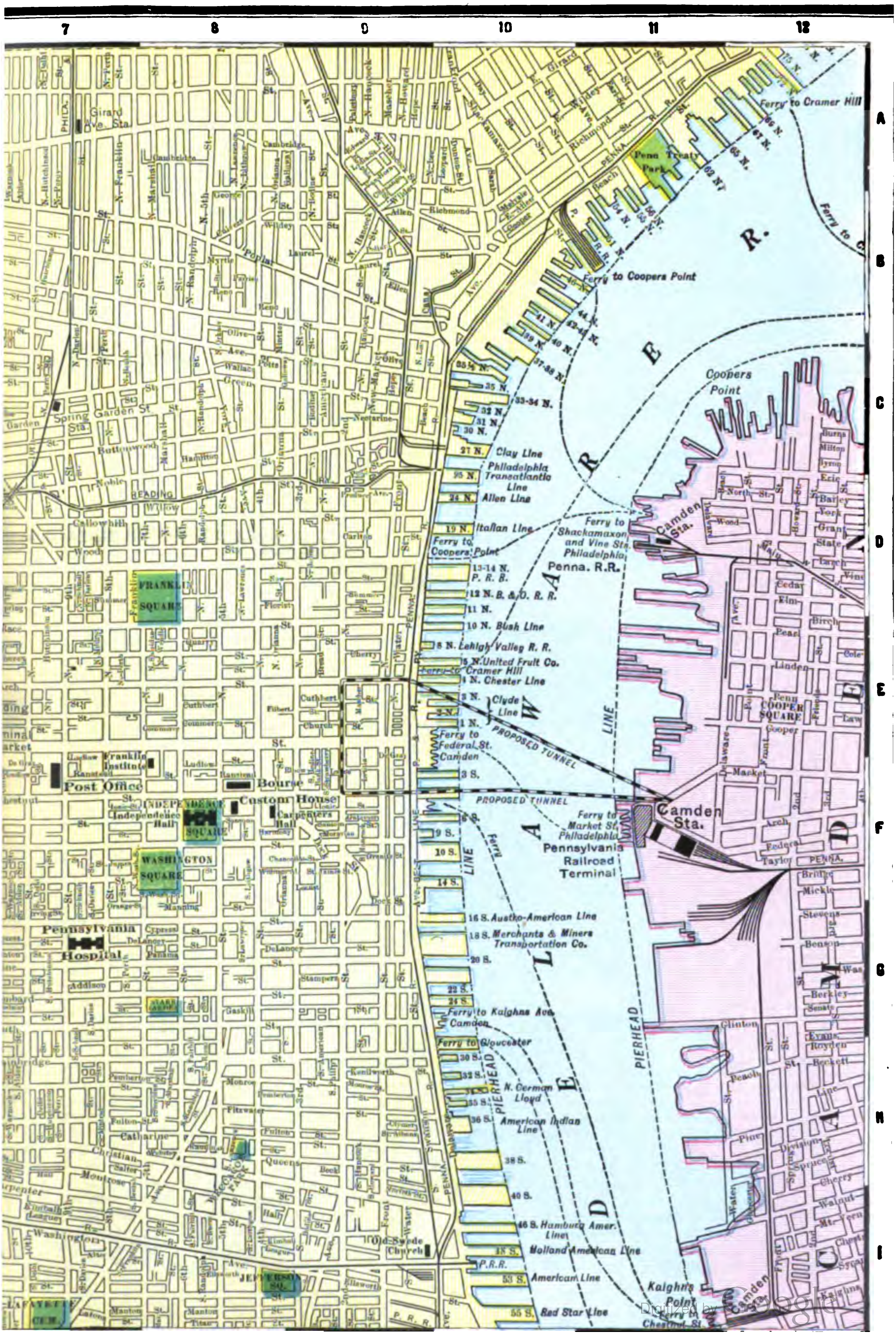
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DELAWARE R.
CAMDEN
Ferry to Cramer Hill
Penn Treaty Park
Ferry to Coopers Point
Coopers Point
Girard Ave. Sta.
Spring Garden St. Sta.
Poplar
Richmond
Beach
Callowhill
Willow
READING
FRANKLIN SQUARE
Franklin Institute
Post Office
Bourse
Custom House
Carpenters Hall
INDEPENDENCE SQUARE
Independence Hall
WASHINGTON SQUARE
Pennsylvania Hospital
Washington
Old Swede Church
JEFFERSON SQ.
LAFAYETTE CEM.
Clay Line
Philadelphia Transatlantic Line
Allen Line
Italian Line
Ferry to Coopers Point
13-14 N. P. R. R.
12 N. B. & O. R. R.
10 N. Bush Line
8 N. Lehigh Valley R. R.
5 N. United Fruit Co.
Ferry to Cramer Hill
4 N. Chester Line
3 N. Clyde Line
Ferry to Federal St. Camden
PROPOSED TUNNEL
PROPOSED TUNNEL
Ferry to Shackamaxon and Vine Sts. Philadelphia
Penna. R.R.
Camden Sta.
Camden Sta.
Ferry to Market St. Philadelphia
Pennsylvania Railroad Terminal
16 S. Austro-American Line
18 S. Merchants & Miners Transportation Co.
Ferry to Kaighns Ave. Camden
Ferry to Gloucester
N. German Lloyd
American Indian Line
46 S. Hamburg Amer. Line
Holland American Line
P.R.R.
American Line
Red Star Line
Kaighns Point
Ferry to Chestnut St.
PIERHEAD
PIERHEAD
LINE
LINE
Ferry
COOPER SQUARE
Penn
Delaware
Front
Market
Federal
Taylor
PENNA.
Bridge
Mickle
Stevens
Benson
Berkley
Clinton
Evans
Royden
Beckett
Pine
Division
Spruce
Cherry
Walnut
Mt. Vernon
Kaighns
Linden
Cooper
Pearl
Birch
Elm
Cedar
Vine
Larch
State
Grant
York
Bailey
Erie
Byron
Milton
Burns
North
Wood

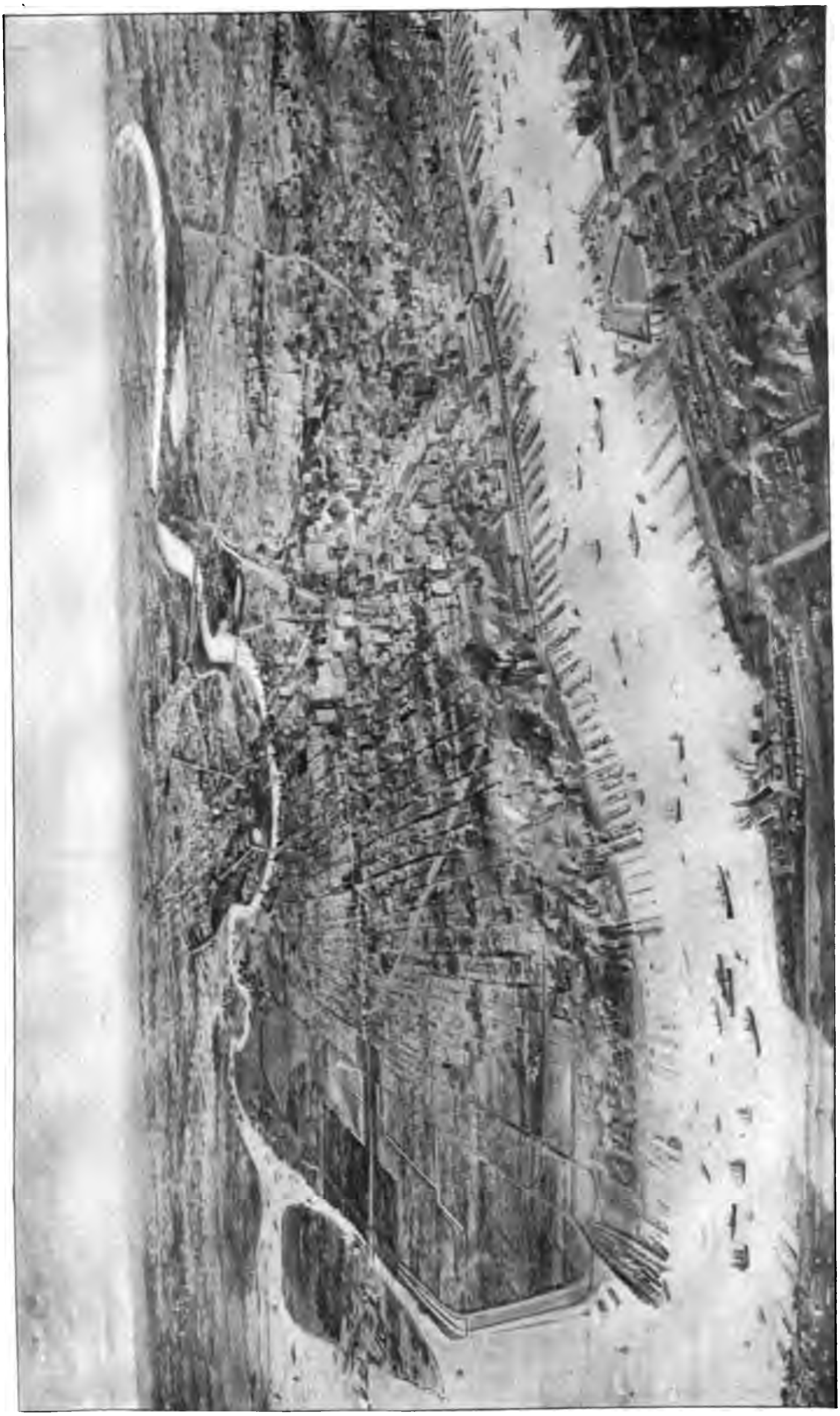
on the peninsula, partly alluvial and partly glacial drift, whereon Philadelphia arose, 96 miles from the Atlantic and about the same distance from New York and Baltimore.

Topography.— The city's area (84,933.12 acres, whereof 1,593 acres is water surface or 132.7 square miles in all) is an irregular figure. Its curving eastern boundary is formed by the Delaware. The southern limit is a line east and west following narrow watercourses which separate League Island and Hog Island from the municipality. Its western and northern limits are Delaware, Montgomery and Bucks counties and are defined by the early colonial administrative lines fixed by proprietory grants. Cobbs and Darby creeks divide off Delaware County on the southwest and Poquessing Creek marks the extreme northeastern limit. Within this area there are three fairly defined regions. The first is the low, flat peninsula between the rivers, from 8.7 to 40 feet above mean low tide. The second region is bounded to the south by a 40-foot contour line, whose southern angle reaches to Broad and Callowhill streets, and rises over on a strike of azoic schists and gneisses (Bush Hill), which extends from the Schuylkill to the Delaware. This region runs to the north, with lower ground near the Delaware, culminating in the northwest in Chestnut Hill, 431 feet high, and other elevations of like height. The third region is west of the Schuylkill (West Philadelphia), a rolling country 200 feet high in Fairmount Park and 100 feet in the built-over sections. The old city was laid out on the peninsula from river to river; the factory section grew up in the second region, with Germantown on the heights, while West Philadelphia began as an open suburb and still is mainly a residential district. Three lesser streams crossing the municipal area originate outside the city limits. The Wissahickon, draining an upland plain in Montgomery County, has cut a canyon-like valley through primitive rocks and enters the Schuylkill at Manayunk, furnishing a remarkable park feature. Across northeastern Philadelphia, which remains in great part open country, the Pennypack and Tacony flow, both draining the plateau to the north of the city. Within the built-over sections the drainage is by parallel streams entering the Delaware and rising in the elevated region in the northwest of the city, the most important being Wingohocking Creek and Gunners' Run, These parallel streams have been made the basis of a sewage system, which has nearly everywhere a fall of from 20 to 40 feet. The easy grades and the absence of restraining physical features have led to the spread of population and habitations in all directions. Settlements started at favorable points, as Germantown on the fertile and sunny southern slopes toward Chestnut Hill; or they grew up around mill, shipyard and furnace and were gradually enveloped by the greater community. Philadelphia's amœba-like growth resembles that of London rather than the organic extension of Paris or New York.

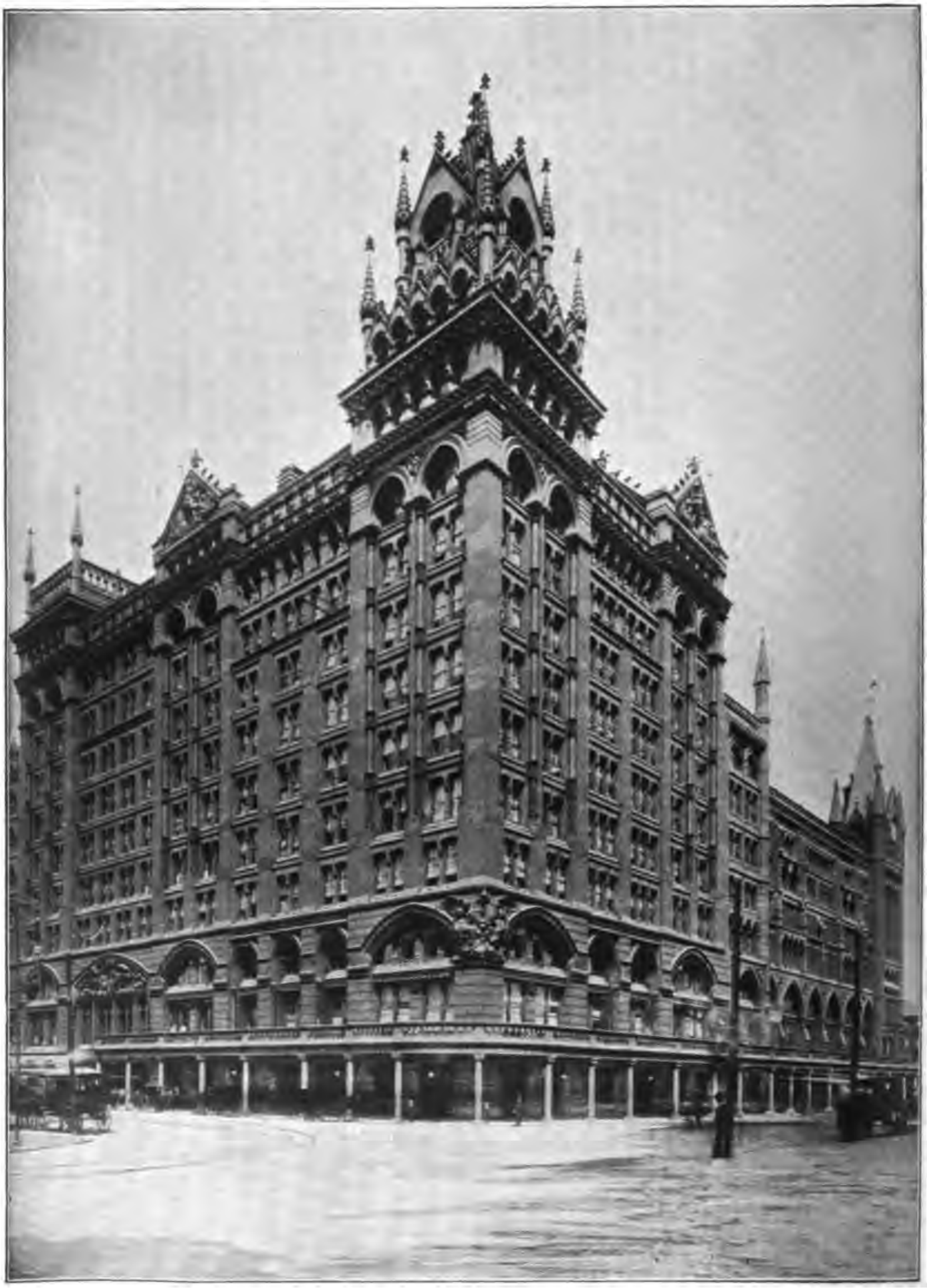
City Plan.— Philadelphia was the first of modern municipalities whose plan was prepared for a particular site. Captain Thomas Holme, surveyor-general for Pennsylvania, whose name has survived in that of the village of Holmesburg on Pennsylvania Creek, made the lay-out in the form of a parallelogram, 10,922 feet 5 inches east and west and 5,370 feet 8 inches north and south, extending from river to river and from Vine street to Cedar (now South) street, comprising two square miles. In this area two streets, Broad and High (now Market) were laid out at right angles, 6 perches wide. The other main streets were laid out 3 perches (50 feet) and the alleys 1½ perch (25 feet) wide. The main streets defined squares of about 400 feet to a side, containing 4 acres each and bisected by alleys. The plan gave 30 per cent of the area to street surface, twice the usual proportion in European cities of the day, and the two main arteries were twice the width of the broadest street provided for in London. Broad street is now 113 and Market street 110 feet wide. This rectangular plan has been extended over the entire area and has guided city planning in America ever since. It was followed by Randell in the lay-out of New York and, by reducing realty to lots of uniform size, it has rendered the transfer of property easy and certain. On the original plan the streets running north and south were numbered, as they still are; those running east and west were named after trees, the botanical vocabulary having since been supplemented by a wider nomenclature. At irregular intervals avenues 100 feet wide have been added, some of these running diagonally. A system of numbering, under which the century changes for every block, makes the house number a co-ordinate and fixes the place of any lot in the city system. Modern ideas of city planning took root late in Philadelphia. Some 20 years ago it was proposed to give more direct access to the northeast from the centre of the city by cutting 100-foot-wide extensions of Kensington and Frankford avenues through to Broad street; the proposals, however, received little official or public support. The Parkway project, conceived about the same time, was not taken in hand energetically until 1909, but has now been carried almost to completion. Beginning with a width of 150 feet, which increases to 250 feet, this magnificent avenue runs from the city hall to Fairmount Park, where it leads through a plaza of 2,000 feet lateral extension to the Municipal Art Museum and where it connects with Fairmont Park drives east and west of the Schuylkill. The building sites on the line of the Parkway have been reserved for the municipal auditorium, the free public library and other structures of a public or semi-public character. The Northeastern boulevard, 300 feet wide and running a distance of seven miles from Hunting Park to Pennypack Creek, is also practically complete: It will form a part of the national Lincoln highway. Besides these 20 other avenues, most of them 148 feet wide, with double or triple roadways separated by planting spaces for trees, shrubs and grass, have been confirmed on the city map. The total length of the park boulevards and avenues thus plotted is 150,240 feet and considerably more than one-half of them are open. The Schuylkill embankments (approved, but stayed by war exigencies) are second to the Parkway alone as city embellishments. The Delaware waterfront improvements are utilitarian in character, though ornamental also in their own way. The foundation of the plan is the widening of Delaware avenue from 150 to 250 feet its entire length (17 miles). The work has been completed on the whole of the old commercial front, with concrete inner bulkheads and nine municipal and about 30 other piers that may be rated as modern. The plan includes the elevation of all railroad freight lines passing through populated territory to the waterfront, with belt-line connections for all piers; the establishment in the extreme south of the city of a freight terminal covering 600 acres and conecting with 10 railroad and nine municipal piers, each about 1,000 feet in length. The city has $13,000,000 immediately available to carry out its part of the work. One double-deck pier has been completed by the city and the Federal government is constructing three others for an oversea shipping depot, which will cost $15,000,000. The revised map of South Philadelphia, showing these improvements with League Island Park, etc., is a good example of modern city planning. Scarcely of less utilitarian value than the Delaware street widening is the Central Traffic Circuit — a parallelogram of 50-foot streets in the heart of the city to be broadened to 140 feet and connected by radial avenues with the northeast, northwest, southwest and the river front. The projected bridge across the Delaware River is nearing realization.

Housing and Public Works.— About one-half the city area is built over, the unimproved property being mainly in the northeast, where a large proportion is still rated and assessed as farm land. The buildings increase on the average about 6,000 yearly, though the number has risen in some years to 11,000. Of this yearly increase all but a few hundreds are small dwellings, costing normally about $3,000 each. The number of buildings in Philadelphia at the last count was 443,566, of which 373,608 were dwellings, two-thirds of the latter being two-story brick houses, and 125,000 owned by the people who live in them. In the newly-developed regions the monotony of rows upon rows of such dwellings, unrelieved by a single distinguishing feature, is being broken by arrangement between the building operators and the city. The new houses are grouped around "garden streets" or "neighborhood centres," the builders dedicating the ground and the city providing for the planting or other beautification of the same. There are in all the city 1,703¼ miles of highways, whereof 1,164½ miles are paved city streets, nearly half of them covered with sheet asphalt, 358¾ miles with granite block, 182½ miles with vitrified brick, 43 miles with wood, asphalt, slag or cement and granolithic blocks and less than 10 miles with cobbles or rubble. Of the country roads, 250½ miles are paved with water-bound macadam, 105½ with bituminous or cement concrete and 182¼ miles are unsurfaced (earth) roads. In the pavement of newly-opened, primary and secondary thoroughfares (118 and 88 feet wide, respectively) an elastic system has been adopted. Beyond the permanent curb lines temporary curbs are laid down, narrowing the roadway to be paved. In the wider streets the middle of the road is also left unsurfaced, to be planted, like the spaces along the temporary curbs, with trees, shrubs and grass until such a time as increasing traffic requires the use of the roadway to its full width. This effects a great saving in the initial cost of the pavement as well as in the upkeep. Meanwhile these temporary and, possibly, permanent garden streets are much increased in value and desirability for residential purposes. The 23 sewerage districts with over 1,000 miles of main and branch sewers (there were only 238 miles in 1883) follow in general the drainage basins of the ancient watercourses and are calculated to dispose of a rainfall whose maxima and minima run from 23 to 67 inches annually. Surface drainage for household waste water still prevails in many of the back alleys of the older parts of the city, and the number of houses not directly connected with the sewers was, until recently, quite large. This nuisance, however, is being abated. In four recent years nearly 40,000 privy vaults were abandoned. The Fairmount waterworks were put in operation as a steam-pumping plant in 1815. After 1822 the pumping was mainly by water power, which had meanwhile been installed. The distributing reservoir was completed in 1837 and the Fairmount works, where the water "pumped itself," became one of the engineering wonders in America. The growth of population necessitated an increased supply and other pumping stations were established successively at Roxborough, Belmont and Queen Lane, all of which drew from the Schuylkill. The Frankford station was the only one on the Delaware and supplied only a small percentage of the total consumed. The contamination of the rivers by sewage led to unsanitary conditions which made the name of Philadelphia a byword. Typhoid fever became endemic. The deaths averaged 611 annually for the five years 1898–1902 and were 948 in 1899, with some 12,000 cases. It was decided in 1902 to purify the water supply by slow sand filtration, and on 1 March 1909 the entire city received filtered water. The filters have a nominal daily capacity of 382,000,000 gallons, and two-thirds of the city water is now drawn from the Delaware, the filter beds of the new pumping station at Torresdale having a daily capacity of 240,000,000 gallons. The installation cost of the system was over $26,000,000. High pressure services for fire protection have also been established in the congested business centre and in the mill district. The necessity of changing the method of sewage disposal was enforced by the health laws of the State as well as by local self-interest, which does not comport with the pollution of the water supply. The plan adopted involves the diversion of the sewage from the streams by three systems of collecting mains to treatment works located, one in the northeast, one in the southeast and the third and largest in the southwest of the city, where the solids will be screened out and digested, and the effluent oxidized by spring filters and made innocuous. The estimated cost of the entire system is $22,400,000; annual cost of operation $500,000 and $2,000,000 a year will be required for new sewers to keep up with the city's growth. The construction of the northeastern system of collectors and Imhoff tanks is well under way.

Government.— Penn granted the first city charter in 1701, on the model of Bristol, which followed English precedents by establishing a body corporate of mayor, council and freemen of the liberties. This charter was superseded



Birdseye view of the city



PENNSYLVANIA RAILROAD STATION, PHILADELPHIA by the act of assembly 11 March 1789, which created a city government with an elective mayor (two-year term), a select council (one member elected from each ward for three years) and a common council (one member for every 2,000 taxpayers in a ward). The mayor's chief function was the charge of the police. Other administrative bodies were created by subsequent legislation: health board, park commission, park wardens, selected by common pleas judges; guardians of the poor, chosen by the councils, whose committees conducted most of the executive administration of the city. The Act of 1854, whereby the city was made coterminous with the county, 13 townships being absorbed, made little change in the form of government. In 1885 the "Bullitt Bill" was passed, embodying the present city charter. This extended the mayor's term to four years and greatly enlarged his powers, giving him the appointment of nearly all city officials. It consolidated the numeous municipal bureaus in departments under single heads, called directors. These are:

The director of public safety, whose department comprises the electrical bureau, the bureaus of police, fire, building inspection, etc., the director of supplies; the director of public works, whose department includes the bureau of city property (city markets, public buildings, parks and squares); the bureau of highways (paving, street cleaning, city bridges); the bureau of surveys (street openings, sewers, city planning); the director of public health and charities, whose department administers the almshouses, hospitals and city farms and includes a housing division; the director of wharves, docks and ferries, in charge of the water front improvement, and whose department in conjunction with the commissioners of navigation (a State board) has charge of the local administration of the port of Philadelphia; the director of city transit, whose department (organized 1 July 1913) is in charge of the planning and construction of a city-owned system of high-speed transit lines.

Other bodies appointed by the mayor having important administrative or advisory functions are the civil service commission; the recreation commission, in charge of public playgrounds; the permanent committee on comprehensive plans, which includes in its membership the mayor and the heads of the engineering departments and bureaus, advises and co-operates in the projection and advancement of public improvements; the art jury, passes on the design and location of all buildings, bridges, arches or other structures and of sculptures or other works of art to be presented to or paid for by the city or other public authority, or for which the city or other public authority is to provide a site, and the zoning commission, empowered to draft a building code, restrict the height, character, use and location of buildings to be constructed or altered, and to prescribe and define residential, manufacturing and other areas.

The departments of education, parks, taxation and city trusts (Girard estate) remain under boards and commissions appointed by the judges of the Courts of Common Pleas. The controller, city treasurer, receiver of taxes and city solicitor are elected by popular vote. The city government is organized on what is called by municipal researchers the federal plan; the authority of the executive officers to raise and expend money for municipal purposes being granted by the legislative branch, which, in Philadelphia, consists of a select and common council. These bodies sit and vote separately; but in practice the financial program is arranged by a joint finance committee, from the recommendations of department chiefs and in co-operation with the controller, the two chambers of councils ordinarily confining themselves to confirmation of the budget and the tax rate thus agreed upon. Loans may be authorized by ordinances of the council when their total does not exceed 2 per cent of the assessed value of taxable property; when this is exceeded ratification of the ordinance by popular vote is required. Franchises for the operation of public utilities must be obtained from the councils. The municipal gasworks are operated by the United Gas Improvement Company under a lease, the city receiving in lieu of rent 20 per cent of all collections from consumers. There is very little other original legislation by the legislative branch of the city government. The department of health prescribes the sanitary ordinances; the board of surveyors in the department of public works makes and revises the street, sewer and water supply systems; the zoning commission is authorized to frame the building code; the art jury and other administrative bodies exercise powers which are legislative in effect. Of course where money is required the departmental and other rulings and plans cannot be carried out unless the funds are provided — and the purpose of expenditures must be stated in the ordinances of councils and have received their approval. The substitution of a small single-chambered city council for the present unwieldy bicameral legislative body of 200 members is a desideratum. The police force of the city consists of 2,500 patrolmen, 300 mounted men and a cycle corps of 50. The traffic regulations are very good. An ambulance service has been organized in conjunction with the hospitals, one of the latter covering each of the 37 ambulance districts. The fire department has 1,037 men and is equipped with 50 steamers, eight chemical engines, 20 hook and ladder trucks, two water towers and one fire boat.

Municipal Finances.— The assessment of real estate for taxes in 1918 was $1,766,553,000. The rate was $1.75 per hundred for the general tax (an increase of 25 cents above previous years) and 60 cents per hundred (an increase of 10 cents) for the school tax. The revenue receipts of the city (exclusive of the school tax) for 1917, the last year of which there are complete returns, amounted to $40,050,418, of which more than one-half, or $20,148,273, was yielded by the real estate general tax. The departmental expenditures for 1917 were $40,223,130. The financial statements of the *City Manual* are not well arranged. A better view may be obtained in the 'Financial Statistics of Cities' published by the United States Census Bureau. These relate to the year ended 30 June 1916, but no essential or fundamental changes in the fiscal administration of Philadelphia have occurred since then. The total revenue receipts of the municipality in that year were $36,195,193, of which $18,607,117 came from general property tax; $2,146,137 from business (chiefly liquor) licenses; $1,142,173 from special assessments; 256,380 from State subventions; $1,972,781 from departmental earnings (of which $405,658 and $243,028 received in fees by the courts and the register of deeds, respectively, were the largest items); $628,549 for highway privileges from public service corporations; $4,301,709 for rents (including $2,784,213, 20 per cent, receipts from consumers of the United Gas Improvement Company); $1,657,258 for interest, on current deposits, sinking fund and public trust funds); $5,142,128 in earnings of public utilities — almost entirely from the bureau of water supply. The governmental cost payments amounted in total to $41,317,229, distributed as follows: Departmental expenditures $23,988,582 (which included $1,668,046 for the administration of justice, $4,532,835 for police, and $1,453,967 for fire protection, $1,194,066 for the financial departments, including the assessment and collection of taxes, and $668,181 for elections); expenditures in public service enterprises $2,202,134 (nearly all in the water supply service); $4,616,534 interest on the funded debt, and $10,509,979 for departmental outlays. The principal outlays were: for the first pavement and repair of streets and roads, $3,646,932, a part of which is recouped in the form of special assessments; for sewers and sewage disposal $1,828,903; for public charities $527,308; for recreation (playgrounds, public baths, etc.), $1,095,398; for material and supplies in the water bureau $1,028,567. The receipts and expenditures of any year rarely balance, the discrepancy being covered by the surplus carried over from the preceding year, and it is often necessary to resort to temporary loans to convert a bookkeeping credit into actual cash. Under the headings «non-revenue receipts» and «non-governmental cost payments» the Census Bureau includes moneys received from the sale of bonds and investments, moneys paid in the purchase of investments and the redemption of obligations and debits and credits representing transfers between the municipality and its independent departments. The following financial statement covers the receipts and payments for 1916 of the city as well as the school district and poor district of Philadelphia:

Cash balance at beginning of year	$16,679,332
Revenue receipts	45,858,425
Non-revenue receipts	24,756,097
Total	$87,293,854
Governmental cost payments	$52,734,967
Non-governmental cost payments	23,441,617
Total	$76,176,584
Cash balance at end of year	$11,117,270

History.— The original site of Philadelphia was occupied by Delaware Indians peaceful and industrious, tributary to the Iroquois. Though the 17th century Swedes and Dutch made a number of settlements on the Delaware River and Bay, most of them abortive, of which the only permanent monument is Gloria Dei (the Old Swedes Church) erected in 1700 on the site of a former Swedish fort. Some 368 Swedes and Dutch and over 800 newly arrived English immigrants (mostly Quakers) were in and about future Philadelphia, when in 1681 Penn obtained his charter as proprietor. The «Letitia» house (now removed to Fairmount Park), which was built by Penn for his town residence, was occupied by the Provincial Council as its official home during the proprietor's absence. The municipal council remained homeless until in 1709 the Towne Hall, a combined market and courthouse, was built opposite the original Friends' Meeting House, in the centre of High street between Second and Third streets, giving that thoroughfare its new name. Until the State House (Independence Hall) was erected in 1735, the Towne Hall was also the frequent meeting place of the general assembly. From its balcony war was proclaimed against Spain 14 April 1740 and later on George Whitfield, the evangelist, addressed his 6,000 or more hearers. The city grew with great rapidity and became the grain and lumber mart of the Atlantic Coast. In 1725 it was overbuilt and passed through its first reaction. The recovery was rapid, however. In 1725 the vessels arrived and cleared from the port numbered 140; in 1735 there were 427. In 1728 the naturalist Bartram built his house and established his world-famed botanical garden on the west bank of the lower Schuylkill. The house has been preserved and the garden is now a city park. The building of Christ Church was completed in 1744. For 40 years in the middle of the 18th century Franklin was the dominant figure, founding the American Philosophic Society, Philadelphia Library, University of Pennsylvania and Pennsylvania Hospital. The first two of these institutions were direct outgrowths of the «Junto,» a literary club organized before 1730, which, through various mutations, led to the committee of safety, whereby the city was governed through the Revolution. «Nothing I ever gained by cunning gave me so much pleasure,» wrote Franklin, alluding to the charter of the Pennsylvania Hospital granted in 1751. The original building fronting on Pine street and extending the whole length of the square between Eighth and Ninth streets is still in service. In the way of amusements early Philadelphians had little choice. Bull-bating remained popular until 1820, when Mayor Wharton confiscated the last bull to appear in a Philadelphia ring. The ordinance against play-acting notwithstanding, the old Southwark Theatre from 1760 enjoyed a precarious existence. It was finally opened, under a license, with the performance of Beaumarchais' ‹Eugenie,› given in honor of General Washington on his return, a victor, from Yorktown. Peace brought a rapid expansion of population and commence, checked somewhat by yellow fever, which had frequently visited the city during the preceding 50 years but came with exceptional severity during the last decade of the 18th century, when it twice ravaged a most filthy city. During the epidemic of 1793 an army of people (17,000) camped in open fields or took refuge in neighboring towns. The scourge claimed 5,000 victims, one-sixth of the entire population. The first organized bank in the United States was established at Philadelphia in 1780 by an unchartered association. This became the Bank of North America, planned by Robert Morris with the approval of Congress and incorporated by the Pennsylvania legislature in 1782. The city suffered another commercial setback early in the 19th century in consequence of the Embargo, which was accentuated by the loss of trade and bank failures attending the War of 1812. The second Bank of the United States, incorporated by act of Congress 10 April 1816, was located in Philadelphia, and on the expiration of its 20-year charter was reorganized as a State bank under the same name. By the year 1820 the city had once more begun to grow. Many charitable institutions, asylums for the blind, the deaf and dumb, the city almshouses, etc., were founded. Girard College was founded and its building commenced in 1833. The decade 1837–47 was a period of disaster, culminating in the failure of the Bank of the United States. Canal and railroad connections with the anthracite coal fields aided in the development of manufactures, and from 1850 Philadelphia led all other American cities in the aggregate value of its products. This industrial growth reached its apex in 1876 and was visualized in the Centennial Exhibition, which was attended by 9,910,966 visitors. A depression ensued and when the city emerged from this in 1879–80 it was to begin a new period of development. The quality of its textile products greatly improved. Cramp, ships; Baldwin, locomotives; Dobson, carpets; Stetson, hats, and eight other industrial establishments were at the close of the 19th century the largest in their lines known anywhere.

Population.— Early estimates of the population of Philadelphia partake of the dubiousness attaching to all colonial statistics. In 1683 the city proper was estimated to have 80 houses and 500 inhabitants. It quadrupled in a year, and in 1699 a rude census showed 4,500 inhabitants. In 1740 the population was estimated at 20,000. A count of houses (4,474) made in 1772 indicates a population of 26,844, and another house census in 1777, showing 5,743 dwellings, indicates a population of 35,000. Exact statistics began in 1790 with the first Federal census. In the following table the population of the city proper and of the city and county combined are shown side by side up to the date of the census of 1850. After that the figures rubricated under the heading «City» show the entire population of the city and county, which had been consolidated:

	City	City and county
1790	28,522	54,391
1800	41,220	81,009
1810	53,722	111,210
1820	63,802	137,087
1830	80,462	188,797
1840	93,665	258,037
1850	121,376	408,462
1860	565,529	....
1870	674,022	....
1880	847,170	....
1890	1,046,964	....
1900	1,293,697	....
1910	1,549,008	....

Down to 1820 the city and county of Philadelphia was greater in population than New York, though the population of the city proper was smaller. In 1830 and 1840 the city was exceeded by New York and Baltimore, and in 1850 by New York, Baltimore and Boston. After the consolidation Philadelphia became and remained the second city until the census of 1890, when it became, as it still is, the third city in the Union. The early population of Philadelphia had a larger proportion of non-English (Germans, French Huguenots and Swedes) than any colonial city, New York soon losing its preponderance of Dutch. The racial conglomeration has continued, though an unusually large proportion of Philadelphia's population is native-born. No other large Northern city has so large a proportion (63 per cent) born in its own State and the ratio of foreign-born is smaller only in Baltimore and Saint Louis. But the persons of foreign parentage constitute more than one-half, 55 per cent. Less than one-fourth (24 per cent) are of native birth and native parentage. The foreign-born constitute 22 per cent of the total and about one-third are of Irish, one-fourth of German and one-eighth of English birth. In number the colored population is larger than in any other Northern city; but it is only 5 per cent of the total, whereas it was 10 per cent a century ago. Statistics on a basis of municipal boundaries often give an inadequate idea of the population grouped about an urban centre. In the immediate vicinity of Philadelphia there live 500,000 people who form as truly a part of the metropolitan community as those who live in the city proper. The census of 1910 shows a population of 1,972,342 in the metropolitan district of Philadelphia, which includes Chester, Darby, Norristown and Bristol, Pa., and Camden, Gloucester and Burlington, N. J. The normal rate of increase is 2 per cent annually, but in the two and one-half years preceding 31 Dec. 1917, there have been added to the community not less than 175,000 inhabitants, indicating a present population of 2,350,000 in metropolitan Philadelphia.

Industry.— Industry has grown commensurately with the population. A consolidation of manufactures began when the number of establishments, which had risen from 8,461 in 1880 to 18,166 in 1890, diminished to 8,381 in 1910. Capital, which had not increased between 1870 and 1890, had quadrupled by 1910, reaching the total of $688,782,000. In 1914 capital invested in 8,454 industrial establishments amounted to $772,696,000. Since then the industrial development has been tremendous. The present capital investment is estimated at 1,000,000,000 and the annual industrial output at more than that in value. The greatest single increase has been in the shipbuilding industry. The yard of the American International Shipbuilding Corporation at Hog Island is the largest in the world. It has 50 ways; its equipment includes 70 locomotive cranes, 650 electric motors and 80 miles of standard railroad track; approximately 35,000 workingmen are employed and the weekly payroll exceeds $1,000,000. Nearly 100,000 people are engaged in the shipbuilding industry within the Philadelphia zone. In rolling mill, foundry and machine shop output Philadelphia maintains its pre-eminence in quantity, though the product of some American cities may exceed it in value. The Baldwin works are still the largest producers in the country of locomotives; the Pencoyd Iron Works, now employed mainly in government service, built the bridge across the Nile below Khartoum and the Quebec bridge across the Saint Lawrence, the greatest cantilever span ever conceived and carried to completion. The product of the rolling mills, foundries and machine shop industries at date of the last census was valued at $50,474,000 a year. Other metal industries were brass and bronze, worth $4,057,000 of output; copper, tin and sheet iron wares, $7,493,000; cutlery, $1,686,000; files, $1,540,000; electrical machinery, $7,065,000. The Disston saw works at Tacony are the largest of their kind in the world. The textile products of Philadelphia were: woolens and worsteds, $54,922,000 (first in the United States); hosiery and knit goods, $23,971,000; cotton goods, $22,538,000; carpets and rugs, $22,629,000. Tanned leather was produced of the value of $23,526,000; boots and shoes, $6,517,000; belting, saddlery and other leather goods, $3,994,000. Other industries in which the city stands in the first rank are: cordage and twine; dyeing and finishing; felt hats (of which 25,000 are produced per day); chemicals ($9,643,000 per annum); medical compounds ($9,423,000 per annum); soap ($7,319,000); paint and varnish ($8,045,000); lumber and plaining mill products ($7,703,000); tobacco and cigars ($13,429,000); confectionery ($7,315,000); fertilizer ($4,268,000); women's clothing ($30,133,000), and millinery and lace ($5,052,000). There has been a great diversion of the industries from their ordinary employment to war work, but the quantity and value of their product as a whole has increased by more than 50 per cent above the figures given. Philadelphia refines 500,000 tons of raw sugar annually, one-sixth of the United States total.

Commerce and Banking.— The Federal Reserve banking district of Philadelphia includes eastern Pennsylvania, the whole of Delaware and all of New Jersey excepting that which lies in the metropolitan area of New York, and is the location of one of the 12 Federal Reserve banks of the United States. The Philadelphia clearing-house transactions for nine months ended 30 Sept. 1918 amounted to $14,276,449,469, an increase of 13 per cent over the corresponding period in 1917. The following is a summarized bank statement of the incorporated banking institutions located in the city, compiled from the latest available State and Federal reports:

INSTITUTION	All resources	Loans and discounts	Investments, cash and credits	Capital and surplus	Deposits	Savings and trust funds
28 national banks....	$587,570,426	$323,937,328	$263,633,098	$70,391,065	$320,040,514	$5,979,814
58 trust companies...	1,459,453,043	175,996,749	1,283,456,294	114,777,949	256,096,516	1,070,497,763
18 State banks.......	11,597,756	6,960,890	4,636,866	2,198,280	6,013,243	2,874,958
Total...........	$2,058,621,225	$506,894,967	$1,551,726,258	$187,367,294	$582,150,273	$1,079,352,535

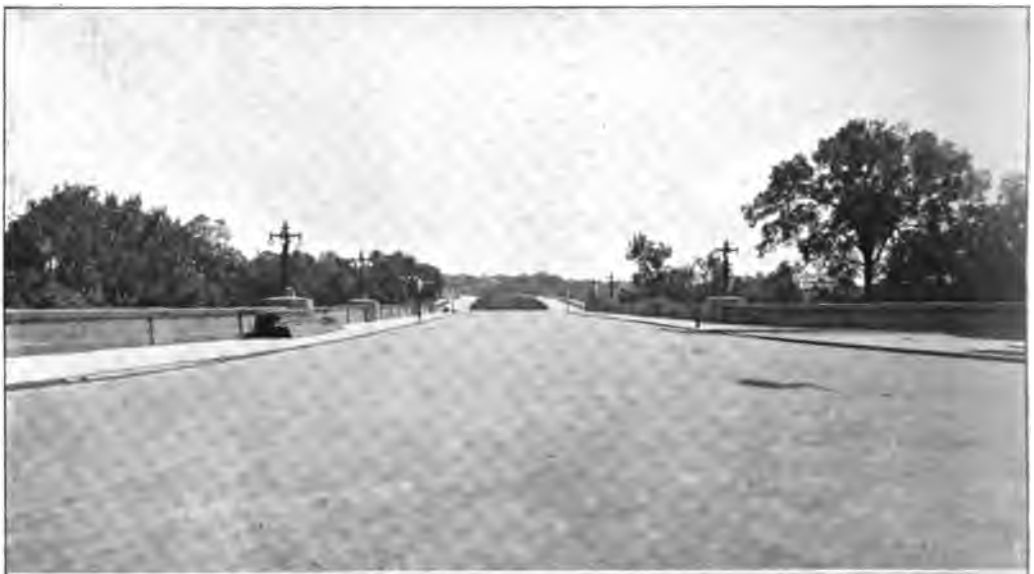
The miscellaneous liabilities of the national banks were $191,159,033, including bank notes in circulation; of the trust companies, $18,090,855; State banks, $511,275. About two-thirds of the investments of the national banks were United States and other bonds deposited in the Treasury as security for circulating notes. Very nearly $1,000,000,000 of trust company investments included in the foregoing statement are held by these institutions as trustees only and represent a corresponding amount of individual trust funds. In addition the trust companies of Philadelphia are mortgage trustees for corporate bond issues to the amount of approximately $2,200,000,000 (face value), and hold securities pledged as collateral for trust bond issues to the value of nearly $700,000,000.

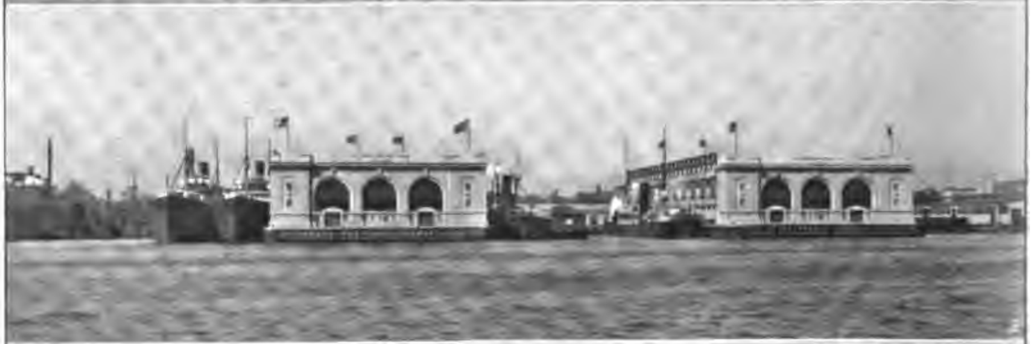
The United States customs district and port of Philadelphia (Act of 24 Aug. 1912) includes all of the State of Pennsylvania east of 79° W. longitude, all of Delaware and all of New Jersey not included in the New York district. Chester, Pa., Wilmington and Lewes, Del., and Tuckerton and Thompsons Point, N. J., are subports. The business of the port of Philadelphia has grown more than proportionately to the growth of the population and industries of the metropolitan district. The exports for four years ended 30 June 1914 were about $280,000,000 in value; in the four years ended 30 June 1918 they amounted to $1,195,000,000, a fourfold increase. The imports in recent years have averaged $110,000,000 per annum, about 50 per cent increase. The Federal government is maintaining a 35-foot channel in the Delaware to the sea. More than 4,000,000 tons of coal are shipped annually by water from the storage yard at Port Richmond. The new grain elevator at Girard Point has a capacity of 2,200,000 bushels and is capable of delivering 60,000 bushels per hour, and there is docking room for three vessels at its pier. The ore piers at Richmond and Girard Point have unloaders which can handle from ship to car 1,000 tons per hour. Almost 45 per cent of the gross tonnage of exports from Philadelphia consisted until quite recently of oil from the refineries of the lower Schuylkill. There has been a great industrial expansion northward from Chester to Philadelphia which gives indications of permanence and emphasizes the suggestion to direct and plan the development of this region as a unit, with a coherent street systems, docks, basins, warehouses, terminals, a factory district and residential areas with parks and playgrounds. A consolidation of a score of small municipalities would be a prerequisite. The area is traversed by three railroads and has a frontage on deep water affording sites for wharves 2,500 to 3,000 feet long. A tunnel under the Delaware affording direct freight routes to New York and the East and railroad connections with the trunk lines to the West and South are other essentials. The project would bring the new port of Philadelphia 10 miles nearer to the sea and establish it below the Horseshoe, whose always dangerous shoals and occasional ice blockades could thus be avoided by shipping.

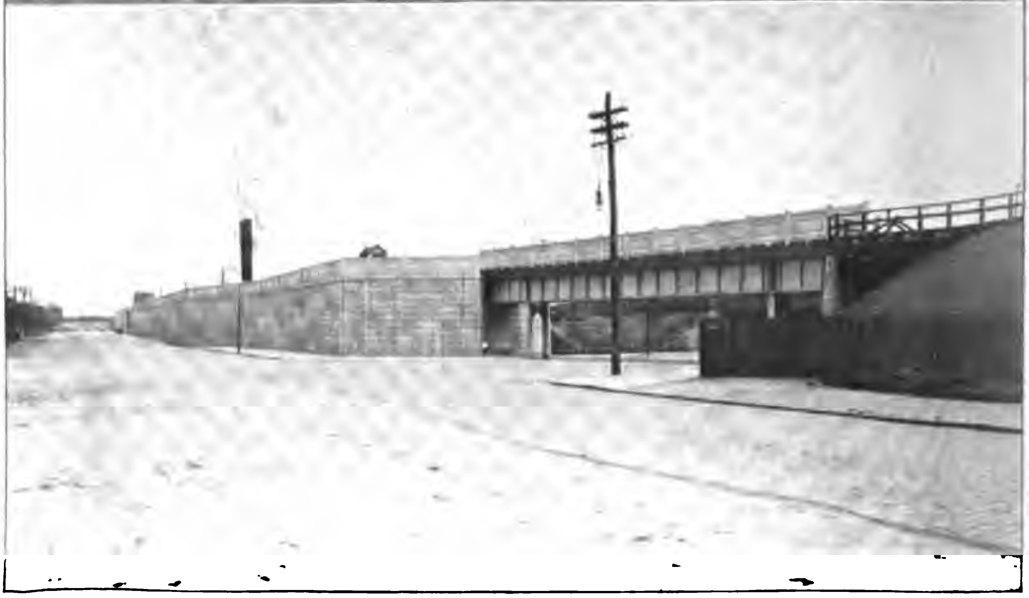
Buildings.—The architecture of Philadelphia was determined by the building material nearest to hand — azoic marble, red sandstone and glacial clay, giving brick. Penn's town residence (the Letitia House) in Fairmount Park and his grandson's manor in the Zoological Garden, with the Chew mansion and various early homes in Germantown, begin the list of historic edifices, wherein are included some of the best examples of colonial architecture known. These are Independence Hall and Christ Church both following Gibbs' models and designed by John Kearseley, and the Pennsylvania Hospital, erected a few years later, constructed of brick imported from England. Ridgeway Branch of the Philadelphia Library (Doric) and Girard College (Corinthian) by MacArthur illustrate Neo-Grecque at its best. Le Bruni's Roman Catholic cathedral and Academy of Music reflect the first appearance in the city of Renaissance, while Notman's

INDEPENDENCE HALL AND SQUARE, PHILADELPHIA

PHILADELPHIA, PA.







1 A view of the Holme Avenue Bridge, on the Northeast Boulevard, looking toward Welsh road. This view also shows a portion of Holme Avenue beyond the limits of the bridge
2 Piers 38 and 40, South Delaware Wharves. View from River looking north
3 Aramingo Avenue and Lehigh Avenue, showing the elevation of the railroad tracks formerly in Lehigh Avenue. This work was very recently completed, and brought to a close one of the most important improvements effected in Philadelphia in many years

Saint Mark's is one of the earlier examples of Gothic. The vast, clumsy, marble pile of the city hall covers four and one-half acres; its fronts are 90 feet high, the central pavilion 303 feet and the tower 547 feet, 11¼ inches — 2¾ feet shorter than Washington Monument, which it was intended to excel. It is 470 feet square, has 15 acres of floor space, has cost $25,000,000, and its design by MacArthur is derived from the style of the Second Empire. On the same square front the Masonic Temple (Norman) by J. T. Windrim, and the Pennsylvania Terminal (English Civic Gothic) by Frank Furness, with florid sculptures by Carl Bitter. Other noteworthy buildings are the Art Club and Horticultural Hall, both designed by Frank Miles Day, and the new United States Mint. The designs for the Municipal Art Museum by Borie, Dantzinger and Trumbau, and the Free Public Library (Renaissance) by Horace Trumbauer, have been approved by the art jury, whose powers have also been exercised to make the numerous new railroad bridges ornaments to, rather than disfigurements of, the streets and streams they cross. The skyscrapers came late to Philadelphia; but there are now quite a number, the best in design being the Wanamaker Store (marble) and the Bell Telephone Central (limestone and brick), J. T. Windrim, architect. The principal monuments are the Soldiers and Sailors' Memorial in Fairmount and the Washington Monument at the Spring Garden entrance to the park. There are a number of equestrian and other bronze statues scattered over the city, which it is proposed to remove to more appropriate surroundings and in more fitting settings along the Parkway.

Street Railways, etc.— The narrowness of the streets in the older parts of the city permits the running of surface car lines in only one direction on all but the few 100-foot thoroughfares, some 30 miles in length. Over 400 miles of the paved streets are tracked. All of the trolley lines have been combined in operation under one corporation, the Philadelphia Rapid Transit Company, with a capital of $30,000,000. This corporation has constructed a high-speed line (subway and elevated) from the Delaware River to 69th and Market streets, where there is connection with suburban electric railways to West Chester, Ardmore and Norristown. The agreement of 1907 with the city requires payment by the Rapid Transit Company for the repair and repayement of streets occupied by its lines, in accordance with the franchises of the underlying corporation. The payments on this account have averaged about $500,000 a year, and will continue during the life of the contract, which runs for 50 years. The city was also to receive one-half the net income from operation after deducting interest, guaranteed dividends and other fixed charges and current obligations of the operating company. Up to date nothing has come to the city from this source. The city is represented on the company's board by three directors, of whom the mayor, ex officio, is one. The Pennsylvania and the Philadelphia and Reading own 360 miles of track within the municipal area, reaching the centre of the city on viaducts and furnishing belt freight lines as well as suburban passenger service. Grade crossings, of which there are several hundred, are being eliminated, the city sharing the expense. Those on the Philadelphia and Reading lines have been abolished to a very large extent; most of those on the Pennsylvania lines will be abated by the elevation of that company's existing and projected freight tracks to the water front. The city-owned high-speed lines, for which $63,000,000 have been appropriated and made available through authorized loans, provide a comprehensive system of intramural transit facilities. The system includes a subway on Broad street, construction of which has been begun; an elevated line to Holmesburg, which is nearing completion, with a surface line extension to Bustleton; a subway on Chestnut street from the Delaware to the Schuylkill, extended by elevated road to Darby; a delivery loop (subway) in the heart of the city; a Parkway subway with an elevated extension to Roxborough. The total mileage of the system as approved is 50, of which 15.4 is subway, 24.5 elevated and 10.1 surface road. These with existing high-speed lines, steam and electric, will give service radially from the city's centre in every direction.

Parks and Playgrounds.— Fairmount Park began with five acres, purchased in 1812 for the waterworks and opened in 1825. It was enlarged to 41 acres in 1855 and to nearly its present dimensions in 1867–68, when a number of country estates on the Schuylkill were expropriated. Fairmount Park includes 373 acres of water surface (Schuylkill River), and its total area is now about 3,546 acres, but this is being added to constantly. By a legislative act of 1917 the condemnation of between 1,100 and 1,200 acres in the Wissahickon Valley was ordered. This will include Fort Washington, second in its historic associations only to Valley Forge. Up to the end of the 19th century the most considerable additions to the city's park area outside of Fairmount were Hunting Park (86½ acres) in North Philadelphia and Bartram's Garden (27 acres) on the lower Schuylkill. A large number of small squares have since then been confirmed on the city map. The more important accessions, however, have been quite recent. Among these are League Island Park (300 acres); Pennypack Park (726 acres); Tacony Creek Park (250 acres); Cobb's Creek Park (288 acres). The last three follow the valleys of the creeks for which they are named from four to six miles. The bank of the Delaware from Torresdale to Tacony, owned by the city and the site of pumping stations, filtration plants and other municipal works and institutions, given landscape garden treatment as intended, will provide nearly four miles of river front park connecting with Pennypack, the largest of the "creek" parks. Burholme Park (69 acres); Whitehall Commons (35 acres); Fernhill Park (10½ acres); Wister's Wood (37 acres) and the Cope Arboretum (22 acres, donated to and administered by the City Park Association) are all in the northeastern or northern sections of the city. The total park area of Philadelphia, including squares and parkways, is 6,000 acres — only a little more than one-third the park area of metropolitan Boston. The Fairmount Park commission governs most of these parks, but some are under the control of the department of public works. Permanent playgrounds, 22 in number (several of them donations of public-spirited citizens — Happy Hollow is the most famous), have been opened by the board of recreation since it came into existence. Of these, eight, averaging four acres in area, are provided with recreation centre buildings. The other 14, which average about two acres in extent, have equipment and are enclosed, and four of them have swimming pools. The attendance is in excess of 2,500,000. Of the 248 school yards in the city, 106, averaging one acre in dimension, are operated as playgrounds in the summer under direction of the board of education. The attendance at the public bathhouses maintained by the municipality exceeds 3,000,000 in a season.

Libraries, Museums, Etc.— There are 65 libraries and reading-rooms in the city. The Philadelphia Library Association — an outgrowth of Franklin's «Junto» founded in 1731 — has 250,000 volumes, equally divided between the main library at Locust and Juniper streets and the Ridgeway Branch at Broad and Christian. It is sustained to the extent of one-half of its disbursements by endowments, the largest being that made by Dr. James Rush — $1,300,000, including the value of the very handsome building for the Ridgeway Branch. The Mercantile has about 200,000 volumes. The library of the University of Pennsylvania, housed in the most ornate structure of the grounds, has had a remarkable growth, increasing in 10 years from 60,000 to over 400,000 volumes. The other large libraries in the city are technical or otherwise specialized in character; the Academy of Natural Sciences, 50,000 volumes and 15,000 pamphlets; Drexel Institute, 27,000 volumes; Franklin Institute, 51,000 volumes, and American Philosophical Society (principally transactions), 35,000. The Pennsylvania Historical Society has a large collection of Americana, chiefly of the Middle States. All of these are open to non-members for consultation, a concession exacted from subscription and association libraries in return for exemption from taxation. The Free Library of Philadelphia was established under a charter granted February 1891; it is governed by a board of trustees pursuant to ordinances of the city councils and an act of assembly. The principal trust funds are bequests of George S. Pepper, R. G. White, George B. Roberts, William Brooke Rawle and Jonathan Livezey. The plant consists of the main library, at 13th and Locust streets, and 27 branches, of which 21 occupy buildings erected from Andrew Carnegie's gift of $1,500,000 to the city. Of the sites for these 15 were donated by citizens of Philadelphia, and two branch buildings, including the ground on which they stand, are gifts of the late P. A. B. Widener and Robert Ryerss. The library building now contains 534,152 volumes and 274,821 pamphlets. During 1917 3,148,509 volumes were lent for home use, including 1,280,943 books taken out and read by children. In addition 1,831,580 persons used the library buildings for reading and study. On 12 May 1917 ground was broken for the new main building, which is being built by the city on the Parkway. This great building, which will have a shelving capacity for more than 1,500,000 volumes, will be an ornament to the Parkway and in every way worthy of the city.

The Philadelphia Commercial Museum is the only institution of its kind in the United States. Its object is the promotion of international trade by diffusion of knowledge of the resources and needs of foreign countries. It occupies a group of buildings at 34th and Spruce streets, where it maintains a very complete exhibition of fibres, minerals and other raw material of industry, illustrative of the commercial geography of the world.

The Academy of Natural Sciences has possibly the largest of all collections of butterflies and marine shells. The Museum of Science and Art of the University of Pennsylvania is notable for its Oriental ceramics, its archæological collections, illustrative of the most ancient civilizations of the Mediterranean Basin, Egyptian, Assyrian, Minoan, etc., and of the ethnography of America. The Franklin Institute shows models of epoch-making inventions. The nucleus of a superior museum of fine arts exists in the Wilstach collection, now housed in Memorial Hall at Fairmount Park. The collection bequeathed to the city by the late J. G. Johnson is on exhibition at the donor's former residence, in accordance with the conditions of the bequest; but it will have to be removed to the projected Art Museum building to protect it from fire and other risks. There are others, notably the superb Widener and Elkins collections, which will inevitably gravitate to the municipal museum. The Academy of Fine Arts has an almost complete collection of portraits by Stuart and a permanent free exhibition of earlier and modern American art, which is outgrowing its space. The display in Independence Hall constitutes a historic art museum in itself and the Fairmount Park Art Association has an endowment fund of $800,000 for the purchase of works of sculpture.

Philadelphia has two opera-houses, the Academy of Music and the Metropolitan, and there are five theatres of modern construction. Mrs. Drew's Arch Street Theatre is still in service; in recent years it has given a home to German and Yiddish drama and vaudeville.

Education.— The Provincial Council, 26 Oct. 1683, provided for the hire of a schoolmaster, and established the fees to be charged for his tuition in the ordinary English branches. In 1689 the William Penn Charter School was opened, chartered 1697, and has been continuously in operation down to the present time, its building standing now, as it has for many years, at 12th and Market. In 1743 the Academy and Charitable School of the Province of Pennsylvania was outlined by Benjamin Franklin, urged in a pamphlet in 1749, and the common council of the city began in 1750 the policy, followed by the city since, of establishing scholarships by giving £200 in cash, £50 per annum for five years and an additional sum for each scholar sent to the Charity Department. Out of this academy grew the University of Pennsylvania.

Public schools for «indigent» children were opened in 1818. There were 6 schools with 10 teachers and 2,845 pupils, about one-fourth the population of school age. Since 1830 the public schools have been free to all, and in 1838, 20 years after their first opening, the number of pupils was 18,794, seven times the original attendance — and there were 167 schools with 257 teachers. The law of 1912 established Philadelphia as a school district in the State's department of public instruction and empowered the board of education to levy the school tax and borrow money independently of the city council. In 1917 the board expended a total of $11,371,018. A remarkable development of the public school system has been the growth of the high school attendance. The high school enrolment now exceeds 18,000, more than three times the number 10 years ago. There are more than 1,600 applicants annually for admission, and to obviate the construction of a new building each year the freshmen classes are segregated in a junior high school. Besides this junior high school there are 11 academic high schools, one industrial arts high school, two schools for trades and higher vocational training, the Normal School with two adjuncts, and the School of Pedagogy, giving two years' post-graduate courses for female and male scholars, respectively, who are qualifying for the profession of teaching. There are also five evening high schools and one evening trade school for those unable to attend in the daytime. The elementary schools are 197 in number and there are 20 elementary evening schools. Vocational training (elementary) is now given to all pupils of the 7th and 8th grammar school grades — in 48 metal and woodworking shops; 48 domestic science classes (cooking, etc.); 40 classes for elementary instruction in the industrial arts (three times that number are required), and there are 122 sewing classes. In 1917 the enrolment in elementary schools (including 8,281 in continuation classes and nearly 3,000 in special classes for the backward and other subnormals) was 212,599, and the grand total for all the public schools was 232,051. The school buildings owned by the district number 328, and there are 17 portable and 12 rented buildings in use. The equipment has been greatly improved since 1912 and the new buildings are models of their kind. In addition the city pays for the tuition of 200 graduates from the public high schools at colleges and professional schools and provides also more than 400 scholarships at the various art schools in the city. The parochial schools in the city — chiefly Roman Catholic — contain about 35,000 pupils and private schools nearly 3,000 more. Girard College, founded by Stephen Girard, has an endowment of nearly $15,000,000 and receives white male orphans from 9 to 19 years of age. It has about 1,600 pupils.

The University of Pennsylvania has about 330 instructors and over 3,000 students. It maintains in its collegiate department, in addition to the usual curriculum, technical courses in architecture, mechanical engineering, music, etc. Its law school has about 400 students. The university, originally upon the site now occupied by the post office at 9th and Chestnut streets, is now at Woodland avenue and 33d street, where since the removal in 1876 there have been constructed 29 buildings, including a library, a museum, a hospital and a botanical garden. The city receives 50 free scholarships in return for its grant of the land on which the university stands. Philadelphia is, and has long been, famous for its medical schools. The university medical department, established 1765, was the first in the United States. Besides this, the best-known medical schools are Jefferson, Medico-Chirurgical, Woman's and Hahnemann. All of these give four-year courses and have university privileges. The College of Pharmacy is one of the best in the country. Divinity schools are maintained in the city by the Presbyterian, Lutheran, Reformed, Protestant Episcopal and Roman Catholic churches. These seminaries have had for a number of years an average of 1,500 students. Approximately 1,200 students attend the four dental schools in the city, including that of the university. Industrial training for the indigent is provided at Girard College and at the Williamson Trades School, just outside of Philadelphia, which has an endowment of $2,000,000. The Drexel Institute gives courses in mechanical drawing, engineering, architecture, chemistry, dressmaking and domestic economy. The Pennsylvania Academy of Fine Arts is the oldest institution of its kind in America and gives instruction in applied as well as in high art. The Academy, the Pennsylvania Museum and School of Industrial Art and the Woman's School of Design (Spring Garden Institute) are attended by an aggregate of nearly 3,000 pupils.

Hospitals, Etc.—There are about 2,500 associations of religious and humanitarian character and aims. The realty owned by these bodies and exempt from taxation is of the value of more than $50,000,000, which is divided in nearly equal parts between churches and charitable and educational foundations. About 1,500 agencies are directly engaged in the relief of physical suffering. Of these 40 are special and 22 general hospitals, with 16 dispensaries. The city maintains four homes for the indigent; the latest published official census shows 204 male and 473 female inmates at the old almshouses in West Philadelphia, 947 old men at the Holmesburg Home and 160 women at the Brown farm. The Municipal Hospital (for contagious diseases) maintains an ambulance service, which makes an average of 10 calls per day, averaging nine and one-half miles per run. The Philadelphia (public) Hospital for the Insane has a world-wide reputation and cares for upwards of 2,000 patients; more than 500 other insane persons are treated and kept occupied on the city farms at Ryberry. The Philadelphia General Hospital (Blockley's) has usually more than 2,100 inmates under treatment. Of private charitable institutions the Pennsylvania (free) Hospital, founded by Franklin in 1751, and its filiate for the treatment of mental and nervous diseases (Kirkbride's) are still foremost. Other large hospitals are the Episcopal, Saint Joseph's, Mount Sinai, German, Jefferson, Polyclinic, Medico-Chirurgical and Pennsylvania University. Among other semi-public charitable foundations the Pennsylvania Institution for the Deaf and Dumb, established 1820; the Home for Training in Speech of Deaf and Dumb Children; the Pennsylvania Institution for the Blind, established 1820; the Pennsylvania Training School for Feebleminded Children, established 1853; the Widener Home for Crippled Children; the Children's Aid and the Society for the Prevention of Cruelty to Children are conspicuous.

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PHILADELPHIA, Academy of Natural Sciences of, an institution for the advancement of learning in the natural sciences, founded in 1812. It has a large and handsome building in the city of Philadelphia and conducts its highly organized work through four principal departments: the library, the museum, the publication office and the department of instruction and lectures. The library has grown chiefly by gifts and numbers upward of 80,000 volumes and many more thousands of pamphlets. It is essentially a reference library. The museum is one of the most important in the world. The collections are in two grand divisions: one for public exhibition, and the other for study by specialists, some of whom come from great distances to avail themselves of its unequaled advantages. Of vertebrate animals there are over 130,000 specimens, comprising 12,000 mammals, 60,000 birds, 20,000 reptiles and 40,000 fishes. Insect specimens number over 400,000 and of shells there are more than 1,500,000 — the largest collection in the world. There are upwards of 50,000 fossils; 30,000 minerals; 20,000 archæological objects and more than 900,000 dried plant specimens in the herbarium. The several series of publications have filled nearly 150 volumes, the annual output being nearly 2,000 pages, with a large number of plates both in half-tone and color. Lectures have been given since 1814. Besides the regular evening winter courses, special educational series are given to schools. For 25 years past all lectures have been free to the public. A number of scientific clubs make the Academy their headquarters, meeting there at regular intervals. Among these may be mentioned the Delaware Valley Ornithological Club and the Philadelphia Botanical Club. The Academy provides opportunities for scientific education free to worthy students. Its regular periodical publications are its *Proceedings* and *Journal.*

History.— Within a few months after its founding a considerable number of valuable scientific works had been presented to the new association, forming the nucleus of its now famous library; and the museum now renowned the world over began its existence with a few contributions by the members, and a collection of 2,000 specimens of minerals purchased upon pledges. By 1814 the Academy had 14 members and 33 correspondents and courses of lectures in botany and entomology were arranged. The *Journal* first appeared in 1817. The necessity for larger quarters led to the purchase of a small meeting-house in 1826, and there the museum was first opened to the public in 1828. The Academy's second building was erected especially for its purpose in 1839. This was enlarged in 1846, and again in 1855. In 1860 the Thos. B. Wilson collection of birds, then the largest in the world, which had long been on exhibition in the museum, was given to the Academy. It comprised 20,000 mounted specimens and 2,000 skins. In the same year a publication fund and several endowment scholarships were established through gifts to the Academy. At this time the *Proceedings* and the *Journal* were the most important publications on natural history in the United States. A large and handsome building was completed in 1876 on Logan square and the collections and library were installed the same year. From this time the growth of the institution was rapid and through appropriations from the State legislature additions have been made to the building from time to time — in 1890, 1892, 1908 and 1911 until the original building has been trebled in size, a fine library stack and reading-room having been added to house the scientific library which is unrivalled in America. In 1912 the Academy celebrated its first centennial and delegates or messages were received from upwards of 500 societies throughout the world. During its long history the Academy has taken part in very many important scientific explorations and some of its members took part in Long's Expedition to the Rocky Mountains (1819–20); the United States Exploring Expedition (Wilkes' Expedition, 1838); Dr. Kane's and Dr. Hays' Arctic expeditions; Audubon's Missouri River Expedition; the first Peary Arctic Expedition (1891–92). The Academy financed one of Du Chaillu's African expeditions and sent members of its staff on exploration to Mexico and Yucatan (1890), and to various parts of the western United States. The institution has also furnished from its membership time and again eminent scientists for posts in various government departments and elsewhere, while the Jessup Scholarship Fund left in trust to the institution has been instrumental in developing many young men who have made their mark in science, by making it possible for them to pursue their studies in science at the Academy.

PHILADELPHIA, The College of Physicians of, an association of physicians founded at Philadelphia on 2 Jan. 1787, having for object, according to its first constitution, "to advance the science of medicine, and thereby to lessen human misery, by investigating the diseases and remedies which are peculiar to our country, by observing the effects of different seasons, climates and situations upon the human body, by recording the changes that are produced in diseases by the progress of agriculture, arts, population and manners, by searching for medicines in our woods, waters and the bowels of the earth, by enlarging our avenues to knowledge from the discoveries and publications of foreign countries; by appointing stated times for literary intercourse and communications, and by cultivating order and uniformity in the practice of physick.» At first the college consisted of 12 senior fellows and an indefinite number of junior and associate fellows; the senior and junior fellows being chosen from physicians who resided «in the City or District of Southwark or Liberties of Philadelphia,» and the associates from «such persons of merit in the profession of medicine» who did not live within these described limits. The first three presidents were John Redman, William Shippen and Adam Kuhn. The college was incorporated on 26 March 1789. The college was never a teaching institution in the ordinary sense of that term, nor has it the power to confer degrees. It has the right only to bestow fellowship and associate fellowship upon those who are eligible for these honors and to elect a limited number of corresponding members. It is, therefore, a scientific body, and once a month, except during July, August and September meetings are held at which papers on medical, surgical and allied subjects are read and discussed. These are published in the ‹Transactions,› the first volume of which appeared in July 1793. At an early period in its history the college assumed a guardianship over the health, safety and even the morals of the community. The first standing committee, that on meteorology and epidemics, had a continued existence from 1787 to 1882. The members of the college did much to combat the epidemics of yellow fever in Philadelphia which were frequent prior to 1820. The college took a prominent part in all movements for the betterment of public health, such as the establishment of a quarantine and hospital for contagious diseases, of hot and cold baths, of the regulation of the practice of physic within the State, and its important actions in relation to the preparation of the Pharmacopœia of the United States. Within recent years, however, the college has confined itself in largest measure to the discussion of scientific matters. The new building of the college was completed and occupied on 10 and 11 Nov. 1909. Here is maintained a large library of over 100,000 volumes, an equal number of unbound pamphlets and 165 medical incunabula. The library is free and is open to any one who is interested. Only Fellows have the privilege of taking books from the building. About 1,200 current periodicals are received. The Mütter Museum is one of the features of the building, with its hundreds of pathological specimens. The museum is open to all research students, medical students and physicians under proper regulations. In 1882 a Directory for Nurses was organized. Since the foundation, 935 Fellows, 91 American Associate Fellows, 51 Foreign Associates and eight Corresponding Fellows have been elected. At present there are 404 Resident Fellows, 27 Non-resident Fellows, 20 Foreign Associate Fellows and four Corresponding Fellows. Several series of lectures are given, under the provision of various endowments, to some of which all physicians and even the general public are admitted. Consult Henry, F. P., ‹Historical Sketch of the College of Physicians of Philadelphia› (New York 1909); and Schweinitz, G. E. de, ‹Account of the College of Physicians of Philadelphia› (Philadelphia 1912).

PHILADELPHIA, Destruction of the, one of the boldest and most daring exploits in naval history. This American frigate had pursued a piratical Moorish vessel into the harbor of Tripoli, 31 Oct. 1803. In endeavoring to beat off from the harbor the *Philadelphia* struck on a sunken ledge which was not laid down in the charts. The Tripolitans at once sent out nine gunboats to attack the helpless vessel, and Captain Bainbridge, in command of the *Philadelphia*, had no resort except to surrender. He, however, first threw all his guns overboard and scuttled the ship, so that if she were pulled off the ledge she would go to the bottom. He and his men were treated humanely. Captain Bainbridge succeeded in sending information of his misfortune to Commodore Preble, in command of the American squadron at Malta. Meantime the Tripolitans had worked the frigate off the rock, plugged the holes in her bottom and removed her into the harbor, where they were fitting her out to be used against the Americans. Captain Bainbridge devised a plan for the destruction of the *Philadelphia* and managed to send it by letter to Commodore Preble who assigned Lieut. Stephen Decatur to the dangerous task. Lieutenant Decatur with 74 volunteers started on his errand 9 Feb. 1804 in a small vessel called a «ketch,» which had been captured by the Americans and christened the *Intrepid*. The *Siren*, Lieut. Charles Stewart, accompanied the *Intrepid* to cover the retreat. A gale sprang up and for six days the men who crammed the «ketch» to its capacity were practically imprisoned and compelled to subsist on half-rations. On 15 February the gale passed and the expedition was resumed. It was a moonlight evening, and as the officers and men were concealed below, the *Intrepid* looked to the Tripolitans like an innocent merchant vessel. A hail from the *Philadelphia* was answered in Maltese, and as the *Intrepid* was warped alongside the frigate, the Americans sprang from concealment, rushed on board and, after a fierce hand-to-hand attack, the Tripolitans threw themselves into the sea. The fire squads went promptly to their stations with the combustibles and the *Philadelphia* was fired in four places. Then under the glare of the flames, with no wind, the «ketch» was slowly moved out of the harbor by sweeps, a target for 115 heavy cannon in the land fortifications and for 24 gunboats and other heavily armed craft which took up the pursuit. The retirement, however, was made without mishap. Parts of the water-logged timbers of the *Philadelphia* were recovered by Captain Breese of the *Cumberland* in 1844 and converted into souvenirs.

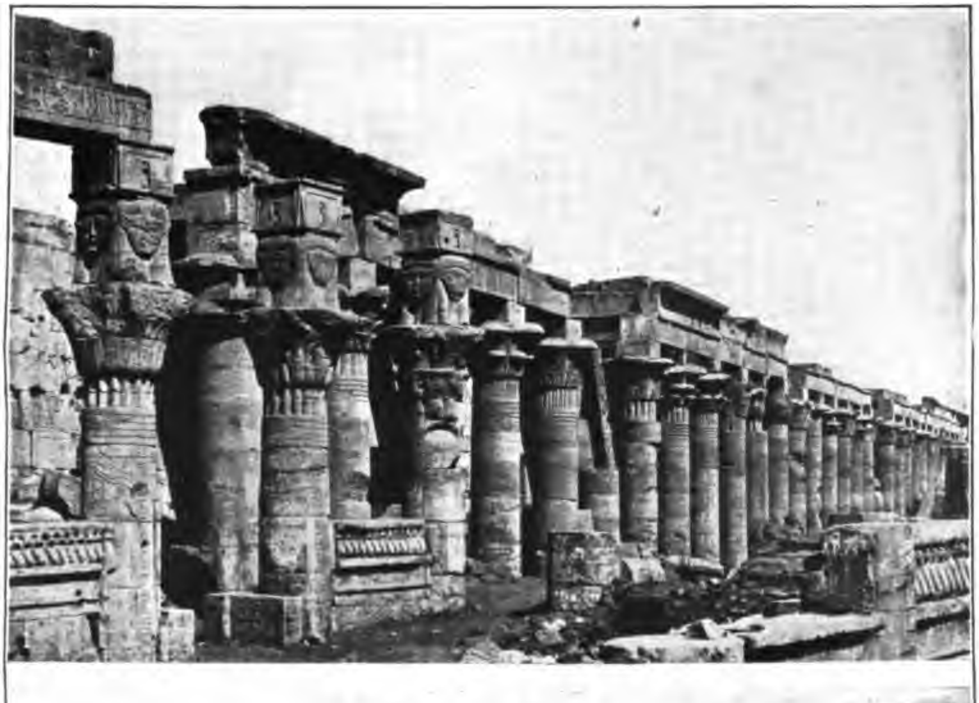
PHILADELPHIA (Tenn.), Military Operations at. Philadelphia, a station on the railroad from Chattanooga to Knoxville, south of Holston River, was held in September 1863 as an outpost to Burnside's army, which was north of the Holston and spread out widely throughout the valley of eastern Tennessee, in the endeavor to keep the entire country clear of the numerous bodies of Confederate troops which threatened it at several points. On 27 September the Union troops were driven from the place and other points south of the river by the Confederates, who had advanced to threaten Burnside at Loudon and to cover a cavalry raid upon Rosecrans' communications with Nashville. In this advance the Confederates captured at various points 6 guns, 50 wagons and some 600 to 700 prisoners. About

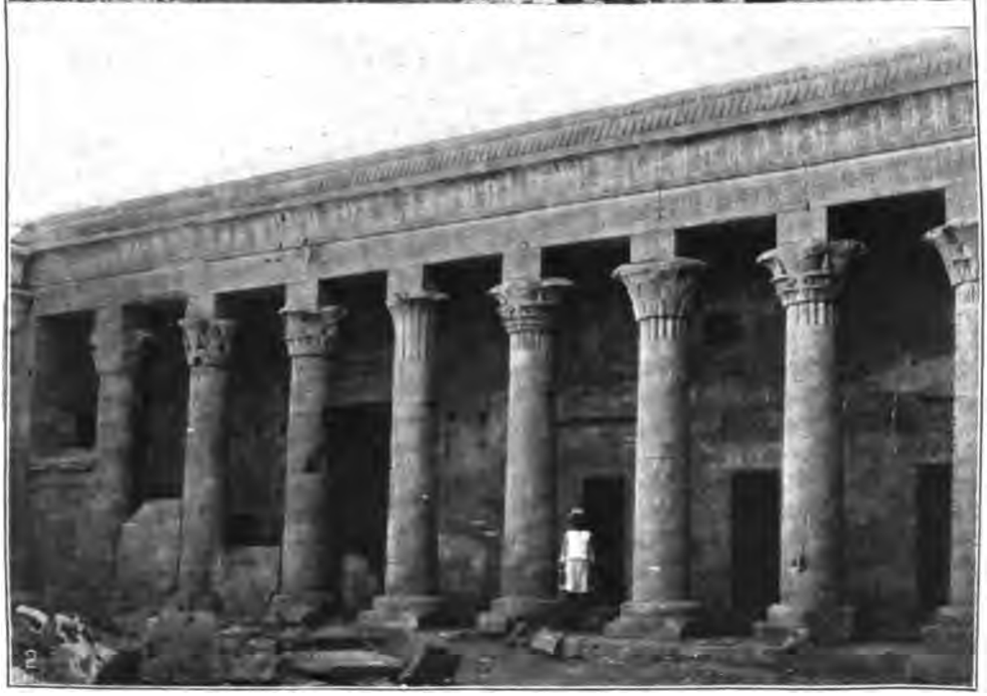
8 October Philadelphia was reoccupied by Colonel Wolford, with his Union cavalry brigade of 2,200 men and six guns. Wolford's force was made up of the 1st, 11th and 12th Kentucky Cavalry and the 45th Ohio Mounted Infantry. On the 19th Gen. C. L. Stevenson ordered the Confederate cavalry brigades of Colonels Dibrell and Morrison, numbering about 7,000 men to move upon Philadelphia and capture Wolford or drive him across the Holston. Dibrell was to move from Cleveland and attack from the south, while Morrison, marching from Wolf River Bridge, was to gain the Loudon road and attack from the north. Morrison, with 1,800 men, in approaching the Loudon road from the west, on the morning of the 20th captured a foraging train with its guard of 40 men, and in quick succession the 11th and 1st Kentucky Cavalry were sent by Wolford to recapture it. A fight ensued, with varying success, but Morrison finally interposed between the two regiments and Philadelphia, driving them in the direction of Loudon, and gaining the road two miles in rear of Philadelphia. Meanwhile Dibrell, moving through Sweetwater, came in sight of Wolford's 12th Kentucky and 45th Ohio, with the six-gun battery, and at 1 P.M. opened with his artillery and charged with his cavalry, but met with such a determined resistance that he was held at bay, and the action on that front lapsed into an artillery duel. Morrison now came up in Wolford's rear, dismounted his men and began his attack. Leaving a small party to oppose Dibrell, Wolford, with his two regiments of 700 men and his battery, turned upon Morrison, repulsing several attacks. After three hours' fighting the artillery ammunition was entirely exhausted, and the carbine ammunition nearly so; Dibrell was closing in on one side and Morrison on the other; and Wolford ordered a sabre-charge to cut his way out to Loudon. He dashed against Morrison and broke through, just as Dibrell was cutting into his rear, detaching scores of prisoners. He left his guns, ambulances, 30 wagons, many horses and mules and 324 prisoners in the hands of the Confederates, and made his way in some confusion to Loudon, taking with him some 50 Confederate prisoners. He was joined on the road by the 1st and 11th Kentucky. Morrison followed until he came in sight of Burnside's infantry near Loudon. The Union loss was 32 killed and wounded and 447 captured. The Confederate loss was 15 killed and 82 wounded, and 111 prisoners.

PHILADELPHIA AND READING RAILWAY COMPANY, a public utility corporation, incorporated in Pennsylvania, 17 Nov. 1896, to acquire the railroad lines of the old Philadelphia and Reading Railroad, which were sold under foreclosure on 23 September of that year. The company operates the railroad formerly leased to the old company, either through transfer of the old leases or through creation of new leases. Its entire rolling and floating equipment is leased from the Reading Company, which equipment it undertakes to maintain unimpaired as to capacity and efficiency. The company is largely engaged in the transportation of coal from the first and second anthracite coal fields in Pennsylvania to tidewater at Port Reading, N. J., and Port Richmond, Philadelphia. The terminals at the latter port cover 140 acres of land and include an extensive system of piers and wharves from whence the company operates a service of sea-going barges and tugs distributing coal to many points along the coast. The yard comprises over 80 miles of track and has accommodations for over 6,000 freight cars. There is a grain elevator with a storage capacity of 1,500,000 bushels and discharging capacity of over 30,000 bushels an hour. There is also an ore-unloading plant and pier with a discharging capacity of 600 tons per hour. On 31 Dec. 1918 the Philadelphia and Reading Company owned 386.79 miles of first track, 186.77 of second track, 75.48 of third and fourth tracks and 620.33 miles of sidings and laterals, making a total of 1,269.37 miles of track. On the same date the company held under leases, 705.92 miles of first track, 379.57 of second track, 50.71 miles of third and fourth tracks and 546.52 of sidings and laterals, a total of 1,652.72 miles under lease. In addition it held trackage rights over 34.46 miles, making a grand total of 2,956.55 miles over which it operates. The main line has 105.63 miles of first track and a total of 595.11 miles of all tracks and sidings; main line branches have total trackage of 56.05 miles; Lebanon Valley branch, 55.48 miles of first track and 243.93 miles of all tracks, etc. On the above date the rolling stock and floating equipment were as follows: 1,028 locomotive engines and tenders, worth $13,334,265; 42,487 revenue freight cars, worth $42,591,681; and capacity of 3,581,408,000 pounds; 954 passenger cars, worth $5,193,047; and 620 work cars, worth $460,103; 21 sea tugs, worth $1,518,906; and 114 sea barges of 83,478 regular gross tons, worth $2,651,017, making a total valuation of rolling and sea-going equipment over $65,500,000. In 1918 the income from all sources aggregated $16,570,754.88; the various deductions from income $8,060,292.90, leaving a net income of $8,510,461.98. Of the latter $6,858,568.24 was appropriated for investment in physical property, leaving a balance transferred to profit and loss of $1,651,893.74. The capital stock amounted to $42,481,700; the funded debt, $49,495,585.61; current liabilities, $5,852,618.77; unadjusted credits, $26,946,257.89; deferred liabilities, $1,373.70; additions to property through income from 1907 and charged as an asset, $28,861,046.35; profit and loss, $10,780,898.74, a total liability of $164,946,404.48. The main line is from Philadelphia to Reading; branches: Reading to Harrisburg, Lebanon to Pine Grove and Auburn, Pine Grove to Rockville, Reading to Shenandoah, Mahanoy Plane to Port Trevorton, with numerous shorter branches in the coal regions.

PHILADELPHIANS, a sect or society of mystics founded in London toward the close of the 17th century by Jana Leade and Dr. John Rordage; the latter a follower of the German mystical philosopher, Jacob Boehme, whose complete works had been translated into English and published at intervals between 1644 and 1662. There had already existed a society or sect of Boehmenists in England with a membership made up of cultured people and simple, but it became merged into Quakerism. The philosophy of Boehme had a special attraction for cultured mystics, and such were Dr. Francis Lee, Dr. Lot Fisher, Dr. Thomas Bromley

PHILAE





1 **Colonnades of the Temple of Isis**

2 **Colonnade of Ptolemy IX**

and others who became founders of the Society of the Philadelphians or of Brotherly Love. The belief peculiar to the Philadelphians was that of possible intimate communion with the spiritual realm, which, years afterward, marked the teachings of Swedenborg. The Society gathered a large following among the members of orthodox churches who retained such membership while subscribing to the doctrines of the Philadelphians. Many of these were in Holland and Germany, to which countries the Society sent literature and missionaries. Consult Illgen, 'Zeitschrift für Historische Theologie' (1865, Vol. II, pp. 171–290).

PHILADELPHUS, or MOCK ORANGE, commonly known in America as *Syringa*, which is, however, the botanical name of the lilac. The name "Mock Orange" arises from the similarity of perfume of the flowers of the syringa and the orange. It is a genus of deciduous or sub-evergreen shrubs of the order *Saxifragaceæ*, and thus related to the *Deutzias*. The species, of which about 30 have been described, are natives of the Northern hemisphere, and very widely distributed, being found in China and Japan, the Himalayas, Mexico and the Pacific Coast of the United States. They have three-nerved leaves, flowers in racemes or solitary on little twigs and many-seeded dehiscent fruits (capsules). Twenty of the species recognized by Koehne are indigenous to North America. The popular name, "syringa," by which several of the species are widely known in America, is misapplied. Syringa is the generic name for lilac. The species are mostly hardy in the Northern States, tropical and sub-tropical species generally excepted. They are readily propagated by means of division of the roots, layers, suckers, cuttings and seeds. But since the species readily intercross, seeds are rarely used except for producing new varieties. They will thrive in any ordinary, well-drained soil and in any degree of sunlight; some will even stand shade, but they thrive best in a deep, moderately rich loam. The flowers appear in early summer upon twigs of the previous year. Pruning is rarely needed, especially in the case of the tall-growing sorts, but, when necessary, should be given in summer just after the plants have blossomed. The popular garden forms are much alike in appearance, but there is a great difference in fragrance. Probably *P. coronarius Chinensis* is the most common. It is a native of western Asia and southern Europe, and is one of the most fragrant. Some very remarkable and valuable varieties have been developed by florists through hybridization. They produce flowers of twice the size of the parent stocks, reaching over two and one-half inches in diameter, and some semi-double and double sorts have been created. Among the more desirable varieties may be named the Lemoine hybrids: *Avalanche; Fantaisie* (tinged with rose); *Mont Blanc; Purpureo-maculatus* (purple-spotted); and *Virginal* (double). The Lemoine varieties require quite vigorous pruning and make fine single specimens when kept dwarf upon a single stem.

PHILÆ, fī'lē, a small island of the Nile in Upper Egypt, on the old boundary of Ethiopia, about seven miles south of Assouan and on the upper side of the First Cataract. The name Philæ seems to be an attempt to reproduce in Greek *Pilak* or *Pilakeh*, a Coptic word meaning "corner" or "end," given because of the border site of the island; it is now called Jeziret el-Birba, "Temple Island," or Jeziret Anas el-Wogud, "Island of Anas el-Wogud," as the scene of a tale in the 'Arabian Nights,' whose hero is so called. The present site of the island is within the Assouan reservoir; see plate accompanying article ASSOUAN. The reservoir waters overflow the island and partially submerge the temples, except from August to December of each year, when the gates of the dam are open and the river falls to its accustomed flood level, but elaborate precautions were taken to strengthen the foundations of the various temples; these are described in the article ASSOUAN. A minute inspection made in 1907 showed that there had been no settling, and except for the blurring of some inscriptions at the base of sandstone structures, which had become infiltrated with salts from the mudhouses built against them, the ruins were unchanged. To some extent, however, there has been discoloration of the sandstone from iron and manganese in its composition. "Temple Island" is the most expressive appellation for this place, which was sacred to Isis and is covered with remains of the best preserved temples of all Egypt. The island is scarcely less remarkable for its position high above the surrounding waters, so that it was never overflowed until the building of the Assouan dam, and for its beautiful vegetation, luxuriant palms and mimosas, than for the adaptation of Egyptian architecture, usually massive and majestic, to the exigencies of an island 1,500 feet long and 480 feet wide. The monuments of Nectanebo II (4th century B.C.) are the oldest now existing on the island or anywhere mentioned in inscriptions as having been built here. The temple of Isis, which was doubtless antedated by an important cultus, was begun in the time of Ptolemy II Philadelphus, carried out by his successor, Ptolemy Euergetes, and added to by Neos Dionysos in the 1st century B.C., when the decorations on the walls were made by Augustus and Tiberius, whose votive offerings in the form of reliefs decorate the exterior, and by Hadrian, who reared a shrine at the west of the main temple. Other buildings are the pavilion of Trajan, a portico of 14 columns; a temple to Hathor, built by Euergetes II and finished by Augustus; the Kiosk; the temple of Harendotes and a shrine of Imhotep. For a full description of the Island consult Bénédite, G. A., 'L'Ile de Philé' (Paris 1893); Edwards, A. B., 'A Thousand Miles up the Nile' (London 1877), and Baedeker's 'Egypt.'

PHILANDER, fi-lăn'dėr, the Dutch knight in Ariosto's 'Orlando Furioso' (1516). He is represented as making love to Gabrina, the wife of his host, and his name has come to be synonymous with masculine coquetry. It was used for the character of the lover in many old plays, and from it came the verb "to philander."

PHILANDER SMITH COLLEGE, at Little Rock, Ark. It was founded in 1877 under the auspices of the Methodist Episcopal Church. The college offers, in addition to the regular collegiate work, a business course, a normal course and a special music course; there is also a preparatory department. The collegiate work is arranged in two courses, the classical and philosophical, and the degrees of A.B. and B.Ph. are conferred. Women are admitted to all courses. Webb Hall, a new dormitory for girls, was opened in 1915. The grounds and buildings in 1918 were valued at over $175,000, and the library contained 2,000 volumes. The annual income for 1918 amounted to $18,000. The students in that year numbered 429 and the faculty 24.

PHILANTHROPY, the impersonal love of humankind based upon the idea of the brotherhood of all men. It is most commonly exhibited by the founding or endowment of public institutions for the organized and systematic relief of the indigent or suffering. In German and Swiss pedagogics the term is applied to the theory of those who advocate Rousseau's plan of education; chief among whom was Basedow (q.v) who founded the first of many Philanthropina at Dessau in 1774. The New York School of Philanthropy, conducted by the Charity Organization of the City of New York, publishes an 'Annual' and a series of 'Bulletins' keeping fully abreast of philanthropic movements. Consult Bolton, S. K., 'Famous Givers and Their Gifts' (New York 1896); Goodale, F. A., 'The Literature of Philanthropy' (New York 1893); Hodges, G., 'Efficient Philanthropy' (New York 1911).

PHILARET, fē-lą-rĕt' (VASILI DROSDOV), Russian prelate: b. near Moscow, 26 Dec. 1782; d. Moscow, 1 Dec. 1867. He was ordained priest and in 1812 became rector of the Alexander Nevski Academy at Saint Petersburg. In 1817 he was made bishop of Reval; in 1819 archbishop of Tyer; in 1820 archbishop of Yaroslav; in 1821 archbishop of Moscow, and metropolitan of Moscow in 1826. He was an eloquent orator and long one of the most influential of the Greek clergy. His cathechism has been used by all the orthodox clergy and in all the schools in Russia since its publication in 1837.

PHILASTER, or LOVE LIES A-BLEEDING. Beaumont and Fletcher, the courtly pair, who, though writing together only some six or seven plays, gave their joint names to a vastly greater output, had most of Shakespeare's secondary virtues. In the handling of plot and situation and character they had all of his theatrical skill; in poesy they had much of his grace and vigor. But they lacked his genius for truth. They carried playwriting out of the domains of life into the regions of convention. 'Philaster' is one of the best examples of that class of tragi-comedy invented for the purpose of appealing to the sensibilities without wringing them with true tragedy. The situation is built up by painstaking artifices to reach a moment of artificial tensity. At any moment "all these jealousies had flown to nothing" had a word been spoken, but the word is not spoken until the authors are ready for it. The authors are no less adept at providing a solution than they are in creating the situation. In this case a tragic dénouement is avoided by the introduction of a crowd as god outside the mechanism and by an opportune confession.

The play itself must be read in the light of the romantic love-comedies of Shakespeare, the materials of which it uses and develops for theatrical effect. The figure of the girl dressed as page and serving as love-tribune of the man she loves comes direct from Shakespeare, as also do the woodland scenes. 'Philaster' is "a weakened adaptation of Hamlet." And yet between the two there is the difference between stylish embroidery in the "vogue" and the first spirited imagining of the pattern. English dramatic poesy has never gone beyond the flexibility and piteous music of the lines of 'Philaster'; the combined verse and prose are handled with perfect grace. The atmosphere of playful unreality is skilfully maintained "'Tis but a bit of childhood thrown away." 'Philaster' was first acted about 1608 at the Globe Theatre and later at the Blackfriars. It was first printed in 1620, after Beaumont's death, which occurred in 1616, under the names of both authors. The plot is original with the writers. The play was very popular, being played after the Restoration, when according to Dryden its authors were more popular than Shakespeare. In adapted form it held the stage until the early 19th century.

Editions: 'Variorum,' ed. Bullen, A. H., 1904 —; Glover, A., and Waller, A. R., 10 vols., 1905–12; Schelling, F. E., 'Masterpieces of the English Drama' (1912); 'Everyman's Library' (Vol. 506); 'Mermaid Series,' ed., Strachey; 'Philaster,' ed., Boas, F. S., 'Temple Dramatists' (1898); Thorndike, A. H., 'Belles Lettres Series' (1906). Consult Ward, A. W., 'A History of English Dramatic Literature, etc.' (1899); Gayley, C. M., 'Beaumont the Dramatist' (1914); Hatcher, O. L., 'John Fletcher, a Study in Dramatic Method' (1905); Thorndike, A. H., 'The Influence of Beaumont and Fletcher on Shakespeare' (1901).

THOMAS H. DICKINSON.

PHILATELIC ASSOCIATIONS, American, various associations in the United States devoted to the study of philately or the science of postage stamps. There are local societies in the larger cities and a national association organized in 1885. The New York City association has a club house and a large and valuable library, and publishes monthly *The American Philatelist*. See PHILATELY.

PHILATELIC SOCIETY, The London, an association founded in London in 1869, for the study of postage stamps. The Society publishes the *Monthly Journal of Philately*.

PHILATELY, fĭ-lăt'ĕ-lĭ, a term embracing the collecting and study of the postage stamps of all nations and the trade which has resulted therefrom. The beginning of this diversion or pastime, as it was in the early days, dates about 1850. It has since developed into a recognized pursuit comparable with the collecting of curios generally. The word philatelist comes from the Greek *philos*, a friend or admirer, and *ateleia*, exemption from taxation. Taxation at the time it derived its name in Greek was represented by a small printed piece of paper or check used as a postage stamp is now used. Primarily philately is an intellectual pursuit. It connotes geography, history, art and science, and stimulates research in many directions. Postage-stamp collecting has been visited with more or less ridicule, but has steadily held its devotees by its unquestionable fascination, and once aroused the collector's interest never wanes.

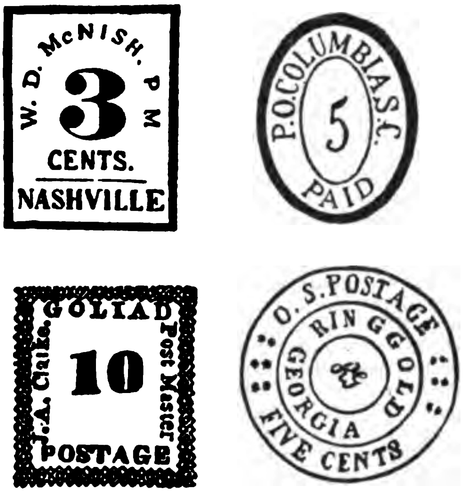
Postage stamps generally bear upon their face the effigy of the reigning king or prince, or the national arms, or various other attributes of sovereignty, or the likenesses of men who have made history for their country. The various alterations to which stamps of a country have been subjected during the passing years have furnished in many instances records of political or dynastical movements of certain states or countries. History is accurately depicted in the stamps bearing portraits of rulers. There have been issued for Great Britain and her colonies over 1,325 stamps of different designs and value, bearing the portrait of Queen Victoria. The stamps of some other countries are embellished by numerals, heraldic devices and arabesques, the latter emanating from Mohammedan lands. Others bear the figures of gods and goddesses and various devices, thus enabling the collector to tell whence they come. The collector can trace the changes of governments, kingdoms and empires that have become republics, and republics that have provisional government regencies, insurrections, rebellions and confederacies. Upon the simple postage stamp can be studied the rise, decline and fall of empires. The displacement of the stamps of the Roman states, of the Church and the kingdom of Naples, tells of the establishment of the kingdom of Italy. The disappearance of the Confederate stamps from circulation told of the close of the Civil War. The absence from circulation of the beautiful stamps of New Brunswick and Nova Scotia heralded the fact of the confederation of these provinces under the Dominion of Canada. The rise of the German Empire made obsolete various continental stamps as well as those of Alsace and Lorraine. In other instances old stamps have been superseded by stamps of newer design, but the majority of obsolete stamps have been set aside by external forces and thus illustrate history and political geography. The more recent rise and rapid progress of Japan is noticed by a series of stamps engraved by native artists and printed upon paper of native manufacture.

The 5-cent stamp of the United States first issued bears the face of one of the heroes of the Mexican War. Inadvertently, the collector is led to inquire into the history of the war, and in a short time learns the relation existing between Mexico and other countries. He learns that Spain was known to the Romans as Hispania, that France was known as Gallia and what now comprises the Ottoman Empire was formerly a group of provinces of Greece and Rome. He must know where each stamp-issuing country is located and by what government it is ruled, in order to understand and classify his stamps properly, and in the chronological order of their issue. The relation philately bears to the study of languages is important. Native letters and Arabic numerals are found upon the stamps of many countries, including Montenegro, Bulgaria, Serbia and Russia. There are countries employing both native and Roman letters and numerals, such as China and Japan, Egypt and Turkey, and some of the native Indian and Oriental states. The first serious collecting of postage stamps, began about 1854-55, and was chiefly geographical, taking the form of arranging on a large sheet a single specimen from each of as many different foreign countries as were obtainable. About 1860 exchanges began to be conducted between boy-collectors, who met in the **London streets** — at first in Birchin lane — with their duplicates. A year or two later these "exchanges" were dignified by the attendance of adult collectors of both sexes, some of them of notable position, who entered into the trading with such earnestness that the police not infrequently dispersed the crowd. There was similar trading in other cities of Europe, and out of these exchanges grew the dealers' shops and a lively and profitable business sprang up. Ardent collectors began to issue pamphlets on the subject, more or less valuable according to their research and means of information. From this beginning the pursuit has expanded to very considerable proportions; and as the number of specimens extant of the older issues is, of course, limited, and the demand by new collectors is continually increasing, the acquisition of rare stamps has become a matter of keen rivalry, in which the prices of such specimens has gone to astonishing figures. Perhaps the record price paid for specimen stamps was reached in England a few years ago when a fine pair of Mauritius "Post Office" stamps brought $17,150. There are now about 750,000 collectors scattered throughout the world in about the following proportions: United States, above 150,000; Canada, above 30,000; South America, 4,000 to 5,000; Great Britain, above 120,000; France and Belgium, above 90,000; Germany, above 50,000; Austria, above 30,000; Italy, above 6,000: Spain and Portugal, above 4,000; Switzerland, above 6,000; all other European countries, above 30,000; Asia, above 1,500; Africa, 1,000 to 1,500; Australia, 2,000 to 3,000; West Indies, above 600; countries and colonies not included in the above list, about 1,000.

Among prominent philatelists are kings, queens, presidents, financiers and men of affairs. There are many private collections valued at from $10,000 to $100,000, and the Rothschild collection is said to be worth $175,000. One of the most valuable is the former collection of Mr. Tapling now belonging through his bequest to the British Museum. It has more than 100,000 specimens of stamps and postal stationery and is valued at $500,000. It is the best in England and the third in value in the world. There are other than philatelists proper who collect stamps. A great many artists gather the more beautiful specimens to study designs. These are also very valuable guides in the matter of engraving on tinted paper. The stamps of the French Republic are masterpieces in this respect. Until they appeared, it was never thought possible to give such effects in engraving on tints. The engraving companies now have in many instances beautiful collections of stamps, but they are, of course, of the uncanceled specimens.

The American Philatelic Association has nearly 2,000 members scattered throughout all the States of the Union. The members in New York City are among the representative men of the country. Among them may be found clergymen, physicians, lawyers, merchants and stock-brokers, there being some 20 members of the New York Stock Exchange in the association. In addition to the parent association there are branch societies in nearly all the large cities of the United States.

The first sale of postage stamps by public auction took place in London 18 March 1872.



Confederate States Provisional Stamps.

The catalogue comprises some 275 specimens, and the time consumed by the sale was about four and one-half hours.

Among the rare American stamps highly prized by collectors are the early United States provisionals, issued in 1845. The government, being unwilling to undertake the expense of a general issue of postage stamps, permitted the postmasters of certain towns and cities to issue stamps at their own expense and for their own convenience. The postmasters of Alexandria, Va., Brattleboro, Vt., Baltimore, Md., New Haven, Conn., New York, N. Y., Providence, R. I., and Saint Louis, Mo., adopted the plan with such success that the government undertook in 1847 a general issue. Other rare stamps are the Confederate provisionals issued during the Civil War by the postmasters in several Southern cities. These stamps were superseded by the regular issue of the Confederate government.

The philatelist collects not only postage stamps, but revenue, telegraph and express stamps, now long since obsolete. The internal revenue stamps formerly used on proprietary articles were of varied design. There was a common stamp for them just as there is now for tobacco. But under the law any manufacturer who was willing to bear the additional expense of preparing a special die and the further cost, if any, of printing stamps after his own design, could have special stamps printed for him at the government bureau. Many of the proprietors of well-known articles, particularly patent medicines, availed themselves of the privilege because of the prestige and advertising which it carried. A unique branch of philately is that of State revenue stamps. These stamps, which are exceedingly rare, represent the tax imposed upon the citizens by the State government in addition to a regular tax imposed by the United States government. Only a few States have ever issued revenue stamps. They are Alabama, California, Louisiana, Oregon and Nevada. Those of Alabama have arms in the centre and are printed in vermilion, red and dark blue. Their values are $1 and $2. Telegraph and express stamps are much prized by collectors on account of their extreme rarity. They are not issued by governments, but by private corporations, and are both stamps and franks.

Second only in importance to stamps themselves is the literature relating to them, and the collector who desires to keep abreast with the latest developments in matters pertaining to stamp collecting must devote considerable time, space and money to his philatelic library. The most rapid growth in this line has occurred within recent years. About 1863 the first journal devoted to the «literature» of postage stamps appeared in Belgium. It was a monthly publication, *Le Timbre Poste*. The first stamp paper started in the United States was the *Philatelic Journal of America*. Philatelic papers are published most numerously in this country, though the highest class of them come from foreign lands. Among the countries that contribute liberally to philatelic literature, outside of the United States, are England, Germany, France, Belgium, Italy, Austria, Spain, Switzerland, Denmark, Mexico, Brazil, Argentine Republic, Chile and Peru, one or more papers being issued from each of these. But more important and desirable to the collector than all the regular philatelic publications are the catalogues, giving a list of all the stamps ever issued and the current prices of most of them. The cash values of the rarer stamps are established by the prices they bring at auction sales. The great values of some of these have led to the production of clever counterfeits and some notable frauds have been perpetrated. Up to a recent date there was but one American catalogue that was generally accepted by collectors and dealers alike, but now there are several catalogues issued in the United States by different houses, all of which are much fuller and more comprehensive than any heretofore published. The catalogues issued by English, German and French dealers are also utilized to some extent in this country as the basis of valuation, as they are usually more correct as to the actual market value of foreign stamps. Handbooks play no small part in a philatelic library. They are usually the production of a student of the stamps of some particular country and the exhaustiveness with which the subject is entered into indicates a marvelous amount of patience and research on the part of the author. These monographs are in demand chiefly by advanced collectors and specialists.

Stringent laws have been passed by the United States and other countries prohibiting under penalty of fine and imprisonment the making in any manner of facsimiles of the regular issues of postage or revenue stamps. These laws prevent also the printing or publishing of facsimiles of government stamps in books, newspapers, periodicals or other publications, as a protection against counterfeiting. Governments, however, the world around have not hesitated to cater to the stamp collectors by special issues of stamps to commemorate expositions or historic celebrations and the profits made on the sales of stamps which never carry any mail are very large. In some of the smaller countries new issues of stamps are much more frequent because of the army of collectors who may be depended upon to absorb a considerable value far beyond the postal needs of the country itself. (See POST AND POSTAL SERVICE). Consult Burroughs, W. D., The Wonland of Stamps' (New York 1910); Creeke, A. B., 'Stamp-Collecting: A Guide for Beginners' (London 1914); Linn's 'Philatelic Handbooks' — on United States stamps (Columbus, Ohio, 1913–14); Melville, F. J., 'All about Postage Stamps' (London 1913); Nankivell, E. J., 'Stamp Collecting as a Pastime' (London 1902); Power, E. B. L., 'The General Issues of United States Stamps' (New York 1909).

PHILBRICK, John Dudley, American educator: b. Deerfield, N. H., 1818; d. 1886. In 1842 he was graduated at Dartmouth College and from 1843 to 1853 was engaged as a teacher in Boston. He was nominated principal of the Connecticut Normal School in 1853 and two years later was made superintendent of schools of Connecticut. In 1857–74 and in 1876–78 Mr. Philbrick was superintendent of the public schools of Boston. He attended the Vienna exposition of 1873 as educational representative of Massachusetts. Subsequently he was president of the National Teachers' Association. He wrote 'City School Systems in the United States' (published by the United States Bureau of Education, Washington 1885) and edited the *Massachusetts Teacher* and the *Connecticut Common School Journal.*

PHILEMON, fi-lē'mŏn, Greek comic poet, the son of Damon: b. Soli, Cilicia, about 360 B.C.; d. 262. He became a citizen of Athens before 330 B.C., and is credited with 53 comedies, some of which may have been written by his son. Of these only fragmentary quotations, mostly from Stobæus, remain (ed. in Kock, 'Comicorum Atticorum Fragmenta,' 1884). Philemon flourished in the reign of Alexander and was a contemporary of Menander, though preceding him by eight years and outliving him by many. He is called the first poet of the New Comedy, the first example of this school being Philemon's play 'Hypobolimæus.' An idea of his wit, which was ranked above that of Menander in his own day, although Menander was called the greater poet, may be obtained from Plautus' imitations of the 'Mercator,' 'Trinummus' and 'Mostellaria' of Philemon's 'Emporus,' 'Thesaurus' and 'Phasma.' Consult Meineke, A., 'Menandri et Philemonis Reliquiæ' (Berlin 1840).

PHILEMON, Epistle to. The little letter of Paul to Philemon is the only private letter of the Apostle which has been preserved, although doubtless he wrote many which have perished. We gather from it, compared with Colossians, that Philemon was a prominent member of the church at Colossae, presumably wealthy, and certainly favorably known for his kindness and hospitality. A slave of his, Onesimus by name, had stolen from him and run away to Rome. Brought in some way in relations with Paul, he had become converted, a thoroughly changed man. Although Paul had not only found him useful but had learned to love him as well, yet it was his duty to return to his master whom he had wronged, and accordingly when the departure of Tychicus for Colossae gave an opportunity, Paul sent Onesimus with him and wrote this letter to ensure for him kind treatment, since, as should be remembered, the law set no limits to the punishment which an angered master might inflict. The letter has long been regarded as a masterpiece of tact. After the usual greetings Paul praises the Christian character of Philemon about which Paul had heard, and then turns to make a most winning appeal for Onesimus, in the past unworthy but now useful, as he assures Philemon in an untranslatable play on the name, urging his master to receive him as a brother in the Lord. Paul even offers to make good to Philemon any loss which he might have suffered through Onesimus, at the same time reminding Philemon of his obligations to himself, and holds out hope that he may soon visit him. This inimitable letter is now accepted with practical unanimity by critics of all schools as a genuine Pauline Epistle, written from Rome at the same time with the Epistle to the Colossians. (See COLOSSIANS, EPISTLE TO.) Too much can scarcely be said of the temper, the skill, the beauty with which Paul handled the situation so difficult at that time. Sabatier said: «We have here only a few familiar lines, but so full of grace, of salt, of serious and trustful affection, that this short epistle gleams like pearl of the most exquisite purity in the treasure of the New Testament,» and Renan said «Only Paul could have written this little masterpiece of the art of letter-writing.»

Bibliography.— Oesterley, W. E., 'Epistle to Philemon' (Expositor's Greek Testament, 1910); Vincent, M. R., 'Epistle to Philemon' (International Critical Commentary, 1897).

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PHILEMON AND BAUCIS, bâ'sĭs, *in Greek mythology,* a couple celebrated for their faithful affection even in advanced age. Jupiter and Mercury in human form traveling through Phrygia found no one willing to entertain them except this aged couple, who received them hospitably, washed their feet, set before them a rustic meal and prepared a couch for their repose. The deities then took their hosts to a neighboring mountain, and when they looked behind them they saw their village sunk beneath the waves of an inundation; but the cottage in which they had welcomed the pilgrims had become a magnificent temple. Jupiter promised also to fulfil all their wishes; but they only asked that they might die together as servants in that temple. At length, at a very advanced age, as they sat at the temple door they were transformed, Philemon into an oak and Baucis into a linden. They were conscious of their change, which came gradually upon them, and while they were able to see and speak they took the most affectionate leave of each other. The trees were regarded as sacred.

PHILETAS (fĭ-lē'tas) **OF COS,** Greek poet and grammarian: b. island of Cos, about 350 B.C.; d. about 290 B.C. He was preceptor to Ptolemy II Philadelphus and is quoted by Theocritus as his model. He was regarded as the earliest of the «grammarians,» and was the author of elegies, epigrams and grammatical works which were imitated and much admired by Propertius, and as a poet was ranked by the Alexandrian critics second only to Callimachus.

Fragments of his poems still in existence were collected and published in 1829. Consult Couat, A. H., ‘La Poésie Alexandrine’ (Paris 1882); Weber, ‘Elegische Dichter der Hellenen’ (1826).

PHILHARMONIC SOCIETIES, are organizations for the cultivation of orchestral music, and are generally found in all large cities. The London society, founded in 1813, has not only produced many works by British composers, but has also brought to England several great foreign composers to conduct at its concerts. Among these are Cherubini (1815), Spohr (1820 and 1843), Weber (1826), Mendelssohn (1829, 1842, 1844, 1847), Wagner (1855) and Gounod (1871), some of whom wrote works expressly for the society. Beethoven's great ninth symphony was written for the London society and its timely aid helped to soothe the sadness of the great composer's last hours. Among its regular conductors have been most of the best known of English 19th century musicians. The Society has an extensive library dating back to the year of its organization. It contains orchestral parts of the principal works of the classic composers sufficient to fit out a full orchestra; and many priceless manuscripts and original scores autographed by eminent composers. The Philharmonic Society of New York is the oldest organized orchestra in the United States. It was founded in 1842, and its first concert was given on 7 December of that year. Among its conductors have been Bergman, Damrosch, Thomas, Seidl, Paur and Walter Damrosch (1902). The orchestra numbers about 110 performers. There are similar organizations in Vienna, Berlin, Boston, Philadelphia, Pittsburgh, Chicago, Brooklyn (N. Y.) and other cities. Consult Hogarth, G., ‘The Philharmonic Society of London’ (London 1862); Huneker, J. G., ‘Philharmonic Society of New York; A Retrospect’ (New York 1917).

PHILHELLENES, fĭl-hĕl'ēnz (Greek, *philellēn*), a term employed to designate those who were friendly to the Greeks in their struggle for independence in the first third of the 19th century. Their sympathies were aroused by the realization that the cause of the Greeks was in fact that of civilization as opposed to barbarism. They were of all nationalities, Lord Byron being one of the most noted, and associations of Philhellenes occupied themselves in collecting resources in aid of the struggling Greeks. As these associations multiplied they came gradually to serve as an excuse for political movements of far-reaching importance.

PHILIDOR, fĭl'ĭ-dôr, the assumed name of the Danican family, of which the most illustrious member was FRANÇOIS ANDRÉ DANICAN, French musician and chess expert: b. Dreux, 7 Sept. 1726; d. London, 30 Aug. 1795. He became a page and then choir-boy in the royal chapel, in which capacity he received instruction in music from the eminent André Campra. For some time he devoted himself to the teaching of music, but dissatisfied with the rewards he turned to chess-playing in which he was already locally famous as an amateur. By the time he was 18 years old he was supporting himself by his playing. In 1745 he started on a tour, traveling in Holland, England and Germany as a chess player. While in England, where he played three blindfold games simultaneously, he wrote a book on the game, which was published there in 1749, and in an enlarged form in Paris in 1777. His musical friends in France, mourning his loss to their art, finally persuaded him to abandon his chess performances, and in 1754 he returned to Paris, where he wrote several successful comic operas. The first of these, ‘Blaise le Savetier,’ was performed in 1759 and brought him immediate popularity. Among the many scores which followed from his pen may be mentioned as of unusual interest ‘Le Maréchal’ (1761); ‘Le Sorcier’ (1764), and ‘Tom Jones’ (1765). He wrote also several original and able tragic operas, ‘Ernelinde’ (1767) being the best known, and various religious compositions. His ‘Analyse du Jeu des Eches’ (1777) was long an authoritative work on chess. Consult Allen, G., ‘The Life of Philidor’ (Philadelphia 1864).

PHILINTE, fĭ-lăṅt, a character in Molière's ‘Misanthrope’ (1666). His easy-going tolerance of the faults of others due to his recognition of the impossibility of reforming them makes him a strong foil to the impatient hero Alceste, his intimate friend.

PHILIP (MARCUS JULIUS PHILIPPUS), styled «the Arabian,» Roman emperor: b. Arabia, about 204; d. 249. He entered the Roman military service and became Prætorian prefect 243. The Emperor Gordian was forced to receive him as a colleague on the throne by the soldiers who had conquered Sapor, king of Persia, and who had found Gordian immature. In 244 Philip put his rival to death and became sole emperor. In 248 he celebrated the thousandth anniversary of the founding of Rome by a remarkable exhibition of the secular games. He was killed in battle by the soldiers of Decius. He has been called by certain writers the «first Christian emperor,» but this is not borne out by facts; as, witness, the accounts of the anniversary celebration. He is, however, credited with exercising a powerful check on the licentious vices of Rome, and the title may have been applied upon this ground.

PHILIP I (Fr. fē-lēp), «the Fair,» king of France, son of Henry I and Anne of Russia: b. 1052; d. 29 July 1108. He was crowned at Rheims in 1059, ruling for a year jointly with his father, upon whose death in 1060 he succeeded to the throne. For seven years he ruled under the regency of his mother and later of his uncle, Baldwin V of Flanders. When the latter died, in 1067, Philip, though but 15 years of age, assumed the government. His reign was troubled by frequent contests between his great feudatories. He was defeated by Robert the Frisian in 1071, but in 1075 he defeated William I of England, Duke of Normandy. In spite of all difficulties, however, he succeeded in greatly extending his domain. He married Bertha of Holland in 1071, and though a son was born to them in 1081, who later became Louis VI, he repudiated his wife and lived openly with Bertrada, Countess of Anjou. Both were excommunicated. In 1095, a year after Bertha's death, he was excommunicated for the second time, and in 1100 was forced by the legates of Paschal II to acknowledge his son Louis VI coregent. The ban of excommunication was removed in 1104 by Paschal upon his promise of reform; a promise which he failed to keep, however.

PHILIP II, or PHILIP AUGUSTUS, king of France, son of Louis VII; b. Gonesee, near Paris, 21 Aug. 1165; d. Mantes, 14 July 1223. He was crowned in 1179, becoming coregent with his father; and a year later succeeded him. He persecuted the Jews, driving them in 1182 from the country, and profited by Henry II's quarrels with his children to force the English king to do him homage for his continental fiefs, by declaring war against him. He undertook the third Crusade with Richard I of England in 1190, but the two kings quarreled after the capture of Acre in 1191, and Philip returned to France, intrigued with the German emperor to imprison Richard on his way home, made an alliance with John, whom he had assisted to the English throne, and, in spite of this, invaded Normandy. From 1194 to 1199 he made war on Richard, and upon his death in the latter year renewed his quarrel with John. A nephew of both Richard and John, Arthur of Brittany, claimed the crown from John, at Philip's instigation, but was seized and killed by the English king, who as Philip's vassal was condemned for this crime to lose his continental fiefs of Normandy, Maine, Touraine and Anjou. Only a part of Guyenne remained in the possession of the English. Philip then prepared to invade England, but was frustrated by the Pope, to whom John had become subservient. John formed an alliance first with Ferrand of Portugal. Count of Flanders, and then with Otto IV of Germany, only to be defeated by Philip's splendid military organization at Bouvines in 1214, the foundation of the continental greatness of the French kingdom. During John's struggle with the rebellious nobles Philip assisted them and put his son Louis forward as a claimant to the English throne. His internal policy was no less active; the Crown was made more powerful by a reformed system of administration; papal influence in France was obstinately combatted; the feudal system made subservient to the king; and in Paris he aided in the building of the first Louvre and Notre Dame, and in the foundation of the university. Philip married Isabella of Hainault, who died in 1190; then Ingeburga, daughter of Waldemar of Denmark, whom he repudiated in less than three months (1193); and in June 1196 Agnes of Meranie (in the Tyrol). This marriage was declared null by the Pope and Philip was forced to receive Ingeburga again. Agnes died in 1201; her children were legitimatized by the Pope. Philip was the ablest of the Capetingian kings of France. Consult Capefigue, J. B. H. R., 'Histoire de Philippe-Auguste' (4 vols., Paris 1829); Delisle, L. V., 'Catalogue des Actes de Philippe-Auguste' (Paris 1856), and Cartellieri, A., 'Philipp II. August' (Leipzig 1913); Hutton, W. H., 'Philip Augustus' (London 1896).

PHILIP III, king of France, called Le Hardi, "The Bold": b. Poissy, 3 April 1245; d. Perpignan, 5 Oct. 1285. Upon the death of his father, Louis IX, in 1270 at the camp before Tunis, Philip was proclaimed king. In 1271 he inherited from his uncle Alphonse, Count of Poitou and Toulouse, much of Languedoc; was under the influence of Pierre de la Brosse, his barber, whom he afterward made the court chamberlain, until 1274 when he married Marie of Brabant, who ruled the king thereafter. In 1279 Edward I of England ceded to him the whole of Normandy. In 1285 he undertook to punish Peter III of Aragon for the massacre known as the Sicilian Vespers (q.v.). He died on his way home after an unsuccessful campaign. Consult Langlois, C. V., 'Le Règne de Philippe le Hardi' (Paris 1887).

PHILIP IV, king of France, called Le Bel, "The Fair," son of the preceding; b. Fontainebleau, 1268; d. 29 Nov. 1314. He came to the throne in 1285, was crowned at Rheims 6 Jan. 1286, and began his reign with Champagne and Brie as appanages, thanks to his marriage (1284) with Johanna of Navarre. Guyenne he won from Edward I of England in 1294 only to restore it in 1299, when he gained the most of Aquitaine. Almost immediately afterward he occupied Flanders, but ruled there so cruelly as to arouse a great revolt under the leadership of the weaver Peter de Koninck. The French nobles were terribly beaten by these Flemings at Courtrai (Kortrijk) 11 July 1302, the "Day of Spurs," "after which 4,000 gilt spurs were hung as trophies in Courtrai cathedral." Two years later Philip made peace with Flanders, giving up his title to the country. The subjection of Lyons to the Crown (1312) was his last and most important addition to the royal territory. But neither temporal strife nor territorial change is the most important event of Philip's reign. His relations with the papacy and his internal and financial policy are the two things that mark out Philip's rule — if not Philip's self, for it is impossible to decide how far his personality was a factor in diplomacy or administration; contemporary mention of him gives no hint of any vigor, force or ability, whereas modern historians are loath to describe the far-reaching events of his reign without intimating that they were primarily the result of his own definite policy. His break with Boniface VIII, whether due to the king or to his civil jurisconsults, began in the early years of Philip's reign, when the Pope attempted to bring Philip and Edward of England to a peaceable understanding. In 1296 the Pope issued a bull excommunicating Philip, and bidding the clergy pay no taxes to the Crown or any other temporality without papal consent, under pains of the ban. An apparent reconciliation took place in 1297, but three years afterward the Pope's legate to France was arrested by the king on the charge (speciously trumped up) of treason, specifically of rousing the people to revolt. In the following year Philip and the French kingdom were interdicted by papal ban. This bull Philip openly burned. The countermove was sharp and decisive; Nogaret, Philip's greatest lawyer-diplomat, in 1303, with the help of the Colonne, seized the person of the Pope, who died soon after (1304). Moreover, Philip succeeded in electing the bishop of Bordeaux, Bertrand de Goth, as Pope Clement V, and in keeping the curia out of Rome and in Avignon, the beginning of the "Great Captivity," during which the papacy was under French control for 70 years. The internal administration of Philip was significant in that fresh and cruel taxes were levied, the Jews (1306) and Lombards (1311) persecuted for their wealth, and the coinage of the realm debased. In 1307 he had attacked the Templars, seizing and executing their grand master and the principal knights, and confiscating their property. Consult Boutaric, 'La France sous Philippe le Bel' (1869); Renan, 'Etudes sur la Politique religieuse du Règne de Philippe le Bel' (1899).

PHILIP V (LE LONG, lė lŏṅg), "the Tall," king of France, son of Philip IV: b. about 1294; d. 3 Jan. 1322. Upon the death of his brother, Louis X, he became regent; and after a few months succeeded to the throne in 1316 by virtue of the Salic law which excluded the daughter of his brother. In 1317 Philip settled the dispute with Flanders, acquiring additional territory, and throughout his reign endeavored to make various reforms, but was usually thwarted by the States-General. In 1320 a cruel persecution against the Jews was begun. Philip's death occurred in the midst of it. Consult Lehugeur, P., 'Histoire Philippe V le Long' (Paris 1897).

PHILIP VI, "the Fortunate," king of France, brother of Philip "the Fair," and son of Charles, Count of Valois, hence founder of the house of Valois and therefore styled PHILIP OF VALOIS: b. 1293; d. Nogent-le-Roi, 22 Aug. 1350. He was grandson of Philip III le Hardi (q.v.), and had shown himself an able soldier before he became count, 16 Dec. 1325, and as count a fiery feudal lord. On the death of his cousin, Charles IV, he was named regent, and his claim to the throne was preferred by the second application of the Salic law (the first in 1317, when Philip V came to the throne) to that of the posthumous infant daughter of Charles, and he was made king, April 1328. The claim of Philip was admitted in 1330 by Edward III of England who had himself laid claim to the throne of France through his mother, daughter of Philip IV. Putting himself at the head of the nobles, who were eager to take vengeance on the Flemish for the defeat of Courtrai, the king won the battle of Cassel, 23 Aug. 1328, and made Flanders a French county. Philip's interference in Scotland, his attempt to close Flanders to English merchants, and a story that he had become Count of Valois by trickery, and so king of France, prompted Edward III of England to reconsider his acquiescence in Philip's accession to the throne, and he claimed the French crown for himself as son of Isabelle, sister of Charles IV (in spite of the Salic law). In 1337 the Hundred Years' War broke out. Its main events occurring in this reign are the defeat of Philip's fleet at Sluys (1340), which laid the foundation of British supremacy in the Channel, and the loss of the great battle of Crécy (1346) and of 30,000 of the flower of the French nobility at Calais (1347). Edward challenged him to a duel, but he declined. The terrible Black Death devastated France during the last years of Philip's life. His reign, though the source of so much mediate loss to France, was not without territorial gain; Valois, of course, came to the Crown; Champagne and Brie were ceded by Philippe d'Ebreux; and Montpellier and Dauphiny were bought. Philip VI was succeeded by his son John II, called "The Good." Consult Gaillard, G. H., 'Histoire de la Querelle de Philippe de Valois et d'Edouard III' (Paris 1819), and Longman, W., 'Life and Times of Edward the Third' (London 1869).

PHILIP II, king of Macedon: b. Pella, 382 B.C.; d. 336 B.C. He was the youngest son of Amyntas II, and obtained at Thebes a careful education, gaining knowledge of military institutions and statecraft from Epaminondas (q.v.), the victor of Leuctra, and familiarizing himself also with the intellectual culture of the Greeks. He was later regarded as an orator of considerable ability. On the death of his brother Perdiccas II (359 B.C.), he became the supreme ruler of Macedonia as guardian of his nephew Amyntas, whom he soon set aside in order to assume for himself the regal title. At that time Macedonia was in very real danger. Pausanias, a pretender who had been expelled from the kingdom, and Argæus, who had once held the throne for two years while Amyntas II was a fugitive in Thessaly, now asserted claims to the royal power. The Pæonians were making attacks at the north, the Illyrians on the west. Philip reorganized the army, increasing its efficiency by the invention of the well-known Macedonian phalanx, a compact mass protected by round shields and bristling with long spears. In a year he had completely freed himself from his enemies, and having thus made his small domains secure proceeded to enter upon that career of aggrandizement which extended Macedonian sway over Greece, and was aimed to include Persia also. There were then three powers upon the position of which his success depended. These were Amphipolis, a city at the mouth of the Strymon, once a colony of Athens, but later successful in revolt; Olynthus, the strongest town of the Thracian Peninsula; and Athens. Philip agreed in secret negotiations with Athens to restore Amphipolis on condition of being given control of Pydna, the latter having a harbor on the Thermaic gulf, then commanded by Athens. He captured Amphipolis (358 B.C.), and then marched on Pydna, the easy conquest of which by his own forces and not through Athenian aid afforded a pretext for refusing to keep his agreement. He prevented any co-operation between Athens and Olynthus by taking Potidæa from the former and giving it to the latter in 356 B.C. Not long after he took the Thracian settlement of Crenides, which he renamed Philippi, and which was the valuable centre of a gold-mining district. His capture of Methone in 352, after a long siege, gave him the key to Thessaly, where he quickly established his ascendency. He marched as far south as Thermopylæ, which he found so strongly guarded that he retired. Already, in 352, Demosthenes (q.v.), in his first philippic, had endeavored to arouse Athens to a sense of its danger. Philip conquered Thrace, by 347 was in possession of all the Chalcidian cities, and in that year took Olynthus, which had received tardy and ineffectual assistance from Athens, with whom Philip concluded peace in 346. He then entered Phocis, destroyed the Phocian cities and had their place in the Amphictyonic Council given to himself. His Hellenic influence was further conceded by his joint appointment with the Thessalians and Thebans to the presidency of the Pythian games. In 340 he began the siege of Byzantium and Perinthus, but Athens, finally alarmed, sent aid under Phocion, who in 339 compelled Philip to raise the siege of both towns. Philip now seemed to turn his attention to the peoples of the north; but his agents were busy compassing his designs. The Amphictyonic

Council declared war in 339 against the Locrians of Amphissa for having seized part of the sacred territory, but the commander of the army sent accomplished nothing. In 337, therefore, Philip was appointed general. He marched through Thermopylæ, and took Elatea. Again Demosthenes thundered; the Athenians were aroused and formed an alliance with Thebes. But the combined army was defeated by Philip at Chæronea (August 338). Thus ended the independence of Greece. Athens was treated with leniency, but Thebes resisted and fared hardly. The invasion of Persia was now within reach. A congress was held at Corinth, to which all the states of Greece but Sparta were invited. At this congress the war with Persia was determined on, and Philip appointed commander of the confederate forces. In 336 B.C. he celebrated with great pomp the marriage of his daughter Cleopatra with his brother-in-law Alexander of Epirus, by which he hoped to heal this division, but he was assassinated during the feast by a Macedonian youth, Pausanias, who had a private grudge against him. Alexander (q.v) and his mother Olympias were suspected of complicity in the plot. Philip was a bold and warlike ruler, with the craft which he found necessary if he were to carry out an ambitious foreign policy by means of a small state. He was a patron of art and literature. Consult Leland, J., ‘History of the Life and Reign of Philip, King of Macedon’ (2 vols., London 1775); and standard histories of Greece. See GREECE, *History*.

PHILIP V, king of Macedon: b. 237; d. Amphipolis, 179 B.C. He was eight years old at the death of his father, and came to the throne in 220 after nine years of capable regency of his uncle, Antigonus Doson. Philip was a general but no statesman. In 217, having joined the Achæan League, he defeated the Ætolians. In order to subdue all Greece he made an alliance with Hannibal against the Romans, who occupied Illyria. In the first Macedonian war (214–205) he accomplished nothing and was forced to a humiliating peace. He still aided Hannibal with supplies, however, and in 200, after the conclusion of the second Punic War, Rome, roused by this fact and by the complants of Attalus, the Rhodians and the Egyptians made war upon him again. He was successful until Flāminius took command, and then the allied army of Romans and Ætolians completely defeated him at Cynoscephalæ in 197, the end of the second Macedonian War. Macedonia became an ally of Rome; all Philip's alliances and conquests were renounced, and he had to pay a heavy tribute. Perseus, his natural son, succeeded to the throne. Consult Droysen, ‘Geschichte des Hellenismus’ (1877–78); and Mahaffy, ‘Alexander's Empire’ (1888).

PHILIP I, king of Spain, surnamed «the Handsome»: b. Bruges, 22 July 1478; d. Spain, 25 Sept. 1506. He was the son of Maximilian I, emperor of Germany, and a grandson of Charles the Bold. He became ruler of the Netherlands in 1482, and by his marriage in 1496 with Joanna, daughter of Ferdinand V, king of Aragon, and Isabella, queen of Castile, he obtained the Crown of Castile in 1504. He was the father of the emperors Charles V and Ferdinand I.

PHILIP II, king of Spain, son of the emperor Charles V and Isabella of Portugal: b. Valladolid, 21 May 1527; d. palace of the Escorial, 13 Sept. 1598. He was married in 1543 to Mary of Portugal, who died in 1545 after the birth of Don Carlos; and early showed himself haughty, cold and restrained, so that the purpose of his father to procure for him the imperial election was made impossible by his unpopularity, and in 1551 he returned to Spain after a three years' stay in Germany and assumed the royal duties there, to which he had been accustomed since his 16th year, when upon his father's departure for Germany the boy had become regent with a council headed by the Duke of Alva. Philip married Mary of England in 1554, and the queen, who was 11 years his senior, seems to have been deeply in love with him and was certainly greatly influenced by his advice. But the English climate did not agree with him, and in 1555 he left the country for Brussels, having been appointed governor of the Netherlands and of the Spanish possessions in Italy; on 16 Jan. 1556 his father abdicated the Spanish throne in his favor. His royal policy was «worldwide power for Spain and the Roman Catholic Church,» but this did not prevent war with the Neapolitan Pope Paul IV, and the papal ally, the French king, both of whom were defeated. Yet in general Philip's project was in behalf of the defense of the Church, which he regarded as a means to his own ends. With English help he had defeated the French at Saint Quentin, 10 Aug. 1557, and at Gravelines, 13 July 1558, and had made the peace of Chateau Cambrésis in April 1559. Upon Mary's death (1558) Philip became one of the many suitors of Elizabeth, her successor, but, learning that her policy was entirely opposed to his, 24 June 1559 married Isabella, daughter of Henry II of France. In the meantime Alva's stern attempts to carry out the policy of maintaining Catholicism in the Netherlands had roused the province to determined rebellion and had annihilated the king's income from Dutch commerce, so that Alva was recalled, and his place taken first by Requesens, then by Philip's brother, Don John, the hero of the wars with the Moors and with the Turks. Don John's want of success was apparently due to the king's refusal of funds as a part of the royal plan to repress this brilliant and popular leader, and he was succeeded by Alexander Farnese. In 1570, after the death of Isabella, Philip married his niece, Anne of Austria, who lived only 10 years and left him one son, the future Philip III. Roused by the widespread assistance offered his rebellious Netherlands, Philip undertook a great scheme of European conquest, claimed and won the throne of Portugal, struck a great blow at the Netherlands by the assassination of William of Orange, and, having made France entirely subject to his policy, in 1588 fitted out the great Armada which was to punish Elizabeth for the execution of Mary of Scotland and to make England a Catholic appanage of Spain. The destruction of this fleet was a terrible calamity to Spain. Troubles with France, where it was only with the greatest difficulty that Philip placed on the throne his daughter Isabella and where Henry of Navarre kept the League in disorder, were followed by the death of Alexander Farnese (1592) and by increased boldness on the part of English privateers against Spanish shipping, so that the Spanish kingdom was practically ruined at the death of Philip, and largely by his ambitious schemes, whose only success was in the firm foundation of the counter-Reformation. Consult the biographies of Philip by Prescott, Dumesnil, San Miguel and Hume and the rehabilitation by Montaña, 'Nueva luz y juicio verdadero sobre Felipe II' (1882).

PHILIP III, king of Spain: b. Madrid, 14 April 1578; d. there, 31 March 1621. He was the son of Philip II and his fourth wife, Anne of Austria, and succeeded his father in 1598. In the next year he married Princess Margaret of Austria. During his reign the war in the Netherlands continued, his general, Spinola, taking Ostend in 1604 after a three years' siege. Nevertheless Philip was at last obliged to admit the independence of the United Provinces and made a truce with them in 1609. In the same year he expelled the Moors from Spain, a step which accelerated the downfall of Spain's importance. The expelled persons were for the most part valuable citizens,— thrifty traders and farmers — and their departure left entire provinces half depopulated.

PHILIP IV, king of Spain: b. Valladolid, 8 April 1605: d. 17 Sept. 1665. He was the son of Philip III, whom he succeeded in 1621. His first Prime Minister was Olivarez, whose maladministration had proved so calamitous in the previous reign. The war with the Netherlands was renewed, lasting until the Peace of Westphalia, when the independence of the Netherlands was conceded by Spain. Other events of this melancholy reign were the war with France 1635–59; a formidable revolt in Catalonia, suppressed in 1652; the revolt of Portugal in 1640 with a long war ensuing which terminated in the Portuguese victory of Villaviciosa in June 1665. An equestrian portrait of this monarch by Velasquez hangs in the Royal Museum at Madrid and is considered the finest portrait by that artist. A second portrait of Philip IV by Velasquez is in the Louvre at Paris.

PHILIP V, king of Spain, grandson of Louis XIV of France: b. Versailles, 19 Dec. 1683; d. Madrid, 9 July 1746. He was the second son of the Dauphin Louis, who died when the boy was 10; received from Louis XIV the title of Duke of Anjou; and as a direct descendant of Philip II of Spain was named successor to Charles II of Spain in the will of that childless monarch in 1700. To withstand this advance of the Bourbon family and of the personal power of Louis XIV, and to promote the claim of the Archduke Charles of Austria, who was as near the Spanish throne as Philip by ties of blood, England, Holland and Austria formed the Grand Alliance and precipitated the war of the Spanish Succession. (See SPANISH SUCCESSION, WAR OF). His realms suffered by the detachment of his domains in Italy and in the Netherlands, and of Minorca and Gibraltar, but he remained king of Spain. The loss of his wife, Maria Louisa of Savoy, in 1714 deprived him of a wise counselor and put an end to the influence of the Countess of Orsini. He married Elizabeth Farnese of Parma, came under the influence of Alberoni, minister from Parma to Spain, and was hurried into war with France by the scheme to arrange for his children by this second marriage. In 1717 Great Britain and Holland, and in 1718, Austria, joined France. The Duke of Berwick invaded Spain, and Sardinia was lost as soon as won. Alberoni was dismissed and his place taken by Jesuit advisers. Philip in January 1724 for obscure reasons abdicated in favor of his son Luis, who died in August, so that Philip had to return to power. His mind failed during his last years. Consult Baudrillart, 'Philippe V' (1890); and Coxe, 'Memoirs of the Kings of Spain' (1815).

PHILIP, often called **KING PHILIP,** chief of the Wampanog or Pokanoket tribe of Indians: b. near the beginning of the 17th century; d. 12 Aug. 1676. He was the youngest son of Massasoit (q.v.). In 1662 he became chief and renewed the former treaties with the whites But suspicion seems from the first to have prevailed on both sides. In 1674 John Sausamon, a "praying Indian," or disciple of John Eliot, reported that Philip was stirring up the tribes against the English. An investigation was made which proved practically nothing, but the colonists were aroused, and the Indians in turn put themselves on the defensive. On 30 June 1675 the first attack was made on the colonists during their return from church. The war was of the most desolating character, the Indians never meeting the enemy in the open field, but rapidly passing from one exposed point to another, burning villages, cutting off by ambuscades detached parties of troops, and shooting down all who strayed outside of the places of protection. Philip also formed an alliance with the powerful tribe of Narragansetts, and in December 1675, 1,000 men under the command of Governor Winslow invaded their territory, stormed a fort in which there were said to have been 4,000 Indians, and utterly destroyed their village with all its stores. The war raged during the first half of 1676 with unabated fury, but the conquest of the Narragansetts and the complete destruction of his own tribe soon left Philip without resources. Deserted by all, he was hunted from spot to spot, and at last, taking refuge at Mount Hope, was there attacked and in attempting to flee was killed by a renegade Indian. Large numbers of the Indians were sold as slaves in the West Indies and South America. During the war, which had lasted a little more than a year, Brookfield, Northfield, and Springfield in the Connecticut Valley, Lancaster, Weymouth, Marlboro, Groton and Medfield in Massachusetts, and Providence and Warwick in Rhode Island, had been destroyed; and many attacks and massacres had taken place. The character of Philip has been variously represented; but it seems plain that the encroachments of the whites were responsible for his desperate outburst, and that, judged by Indian standards, he was a valiant warrior.

PHILIP, John Woodward, American naval officer: b. New York, 26 Aug. 1840; d. Brooklyn, N. Y., 30 June 1900. He entered the United States Naval Academy in 1856, was appointed a midshipman in 1861, served on the *Constitution* and the *Santee* and was promoted in that year to be acting commander of the sloop-of-war *Marion*. In 1862 he received the rank of lieutenant, served on the *Chippewa, Pawnee* and the monitor *Montauk* and took an active part in the siege of Charleston, S. C. In 1868 he was promoted lieutenant-commander and served in the Asiatic and European squadrons until

1874 when he was commissioned commander. He was appointed to command the Woodruff scientific expedition round the world in 1877, was lighthouse inspector in 1884–87, received the rank of captain in 1889 and in 1894–97 was in command of the Boston navy yard. In 1897 he was assigned to the command of the battleship *Texas* and played a distinguished part in the battle of Santiago in 1898. In that year he was placed in command of the North Atlantic squadron and in 1899 was promoted rear-admiral in charge of the Brooklyn navy yard, in which command he remained until his death. Consult Mackay, 'Life and Adventures of Jack Philip, Rear-Admiral United States Navy' (1903).

PHILIP, The Adventures of, a novel by W. M. Thackeray, published in 1862. It was a sequel to 'The Shabby Genteel Story' and first appeared serially in the *Cornhill Magazine* (1861–62).

PHILIP THE APOSTLE, the fourth of the 12 Apostles chosen by Jesus Christ. In the synoptical gospels he is merely named on occasion as one of the 12; in the Fourth Gospel he is individualized; there the manner of his call is told. Jesus "found Philip," who "was from Bethsaida" and said to him, "Follow me." He appears to have been a disciple of John the Baptist, and to have been influenced to approach Jesus by Andrew. Immediately after he was himself called he brought to Jesus his companion Nathaniel (called also Bartholomew). Philip is the only one of the apostles who had a Greek name; probably he spoke Greek, as it was to him that "certain Greeks came" to request to be admitted to the presence of Jesus (John xii, 20–22). He is one of the two apostles who alone are named in the narrative of the miracle of the feeding of the 5,000. (John vi, 5–9). Of his life after the apostles went forth on their mission very little is known. According to Theodoret and Eusebius his special field was the two Phrygias. His festival is observed in the Eastern Church on 14 November, in the Latin Church on 1 May.

PHILIP THE BOLD, duke of Burgundy: b. 15 Jan. 1342; d. 27 April 1404. He was the fourth son of John, king of France. He fought at Poitiers (1356), where, according to Froissart, he acquired the surname of the Bold, shared his father's captivity in England, and on his return his father restored for him the Duchy of Burgundy, which he had united irrevocably to the crown, and made him premier peer of France. Philip married in 1369 Margaret, daughter of Louis, Count of Flanders, which gave him on the death of his father-in-law (1384) the counties of Flanders, Artois, Rethel and Nevers, and made him one of the most powerful sovereigns of Europe. Philip served against the English in campaigns in Beauce and Burgundy (1364), before Calais (1369), in Poitou (1372) and Flanders (1377). On the death of Charles V (1380) he became regent with his brothers. His administration in Flanders appears to have been wise and conciliatory. In 1388 the king, Charles VI, took upon himself the administration of the kingdom but in 1392 showed signs of insanity, and Philip resumed the regency, which he retained till his death in 1404.

PHILIP THE EVANGELIST, or **PHILIP THE DEACON,** was with Stephen and five others, all Greeks, chosen by the apostles to administer the economic affairs of the faithful in Jerusalem. After the death of Stephen, Philip went as an evangelist into Samaria, where his ministry was exceedingly fruitful (Acts viii), and where Simon Magus, or Simon the Sorcerer, professed the faith, convinced by Philip's preaching. Other incidents of Philip's life recorded in the same chapter of Acts are, the conversion of the Ethiopian eunuch, and the preaching of the gospel in all the cities of Philistia till he came to Cæsarea. He appears to have fixed his residence there, for several years after, when Paul visited Cæsarea (A.D. 55) he was entertained in the house of Philip, who at that time "had four daughters, virgins, which did prophesy" (Acts xxi). The history of this Philip has been by many ancient writers confounded with that of Philip the Apostle. The Latin Church commemorates Philip the Deacon on 6 June.

PHILIP THE GOOD, duke of Burgundy: b. Dijon, 13 June 1396; d. Bruges, 15 June 1467. He succeeded his father, John the Fearless, on the assassination of the latter in 1419, and at once entered into the Treaty of Arras, by which he recognized Henry V of England as successor to the crown of France. Charles VI concluded with him the Treaty of Troyes (1420), which was accepted by the States-General and the parliament, excluding the Dauphin from the succession and recognizing Henry as administrator of the kingdom and heir to the crown. Both Henry V and Charles VI died in 1422, and Henry VI was then proclaimed king of France. Bedford, who now became regent of France, married Philip's sister. Disputes with the English presently followed and Philip, making his peace with Charles VII, concluded a defensive alliance with him, and declared war on England. He received the Dauphin Louis (see LOUIS XII) at his court, when he quarreled with his father (1456) and accompanied him to his coronation in 1461. Philip was much beloved by his subjects, and under his rule Burgundy was both prosperous and tranquil. He was succeeded by his son Charles the Bold.

PHILIP THE MAGNANIMOUS, landgrave of Hesse: b. Marburg, 13 Nov. 1504; d. Cassel, 31 March 1567. He was the son of William II, whom he succeeded under the regency of his mother in 1509. He vanquished Franz von Sickingen in 1523, and joined the princes who went out in 1525 to quell the insurrection of the peasants. The same year he issued an edict on the preaching of the gospel and the morality of the clergy, and to aid the success of the new doctrine, formed the League of Torgau with the Elector of Saxony in 1526. At the Diet of Spires he spoke in behalf of the rights of the Lutheran Church. He then expelled the monks from the monasteries and confiscated their revenues to secular purposes. In 1527 he founded the University of Marburg; subscribed the protestation to the Diet of Spires in 1529, and submitted the Confession of Faith at Augsburg in 1530. He was, with the Elector of Saxony in 1531, head of the Schmalkaldic League but was obliged to submit to the Emperor Charles V after the battle of Mühlberg (1547). In 1552 he obtained his freedom, and after his return to his dominions he sent a body of auxiliaries to assist the French Huguenots. With the consent of his wife, Christina, who lived till 1549, and after obtaining the assent of Luther and Melanchthon, he in 1540 married Margaret of Saale, usually called the «left landgravine,» and had by her six sons and a daughter, an alliance which caused much scandal. Consult Rommel, ‹Philip der Grossmüthige Landgraf von Hessen, nebst einem Urkundenbuche› (1830); Ranke, ‹History of the Reformation in Germany› (English translation 1845–47).

PHILIP THE MAGNANIMOUS, Order of, an order founded by the Grand-duke Ludwig I of Hesse, 25 Aug. 1807. There are five classes; the decoration is a cross of white enamel, and the motto, «Si Deus nobiscum, quis contra nos?» (If God be with us, who can be against us?).

PHILIP NERI, Saint. See NERI, SAINT FELLIPPO DE.

PHILIP OF SWABIA, emperor of the Holy Roman Empire: b. about 1177; d. 21 June 1208. He was the youngest son of Frederick Barbarossa and was educated for the Church, becoming bishop of Würzburg in 1191. He resigned his see the next year and in 1196 succeeded to the dukedom of Swabia. He attempted to obtain the German crown for his infant nephew, Frederick II, but was unsuccessful in this, though himself chosen emperor of the Holy Roman Empire in 1198. He was opposed by the Guelf candidate, who was crowned two months before him. Otho was supported by Pope Innocent III, but Philip at last secured the assistance of the archbishop of Cologne and other great rulers and was crowned by the archibshop in 1205. Consult Winkelmann, ‹Philipp von Schwaben und Otto IV, von Braunschweig› (1873–78).

PHILIP AND HIS WIFE, a novel by Margaret Deland, published in 1895. The book might well be called a study in selfishness, although its emphasis seems to bear upon marriage and the marriage laws; concerning which the author propounds certain theories and problems, without offering any direct solution. There are some scenes of great dramatic power and the background of village life in southern Pennsylvania is pictured with much charm.

PHILIPP, fē-lēp, **Isidor,** French pianist: b. Pesth Austria, 1863. He removed to France when very young, was educated in the Conservatory and became one of the most popular Parisian pianists of the day. His appearances in London and Brussels were also very successful. He has made a specialty of classical chamber music and has published editions of classic studies as well as compositions of his own. He was one of the founders of the Société d'Art, of which he afterward became president. Since 1903 he has been a professor in the Conservatoire at Paris.

PHILIPPA (fĭ-lĭp'ạ) **OF HAINAULT,** hā-nō', English queen, daughter of William the Good of Holland and Hainault: b. Holland 1314; d. Windsor Castle England 15 Aug. 1369. She was married to Edward III of England by a special papal dispensation in 1328 and was crowned at Westminster in 1330. Her marriage was of political importance, inasmuch as it strengthened the friendship between England and Flanders, greatly benefiting the commerce of England. She was very popular among her subjects and some authorities credit her with having summoned and harangued the forces which defeated the Scots at Neville's Cross. She was the mother of seven sons and five daughters, her eldest child being Edward the Black Prince.

PHILIPPE DE CHAMPAIGNE, French painter: b. Brussels, 26 May 1602; d. Paris, 12 Aug. 1674. He first appears in history as engaged with Duchesne on the decoration of the Luxembourg Palace at Paris, where he was persecuted by the envy and jealousy of his collaborators and driven back to Brussels (1627), but was recalled by Queen Maria de' Medicis and appointed court painter. He was elected successively member, professor and rector of the Academy. His fame at Paris was, however, soon eclipsed by that of Le Brun, and he retired to Port Royal, where the recovery of his daughter, a nun in that monastery, from severe sickness, gave occasion for the lovely picture now in the Louvre, ‹Sister Susanne and Mother Agnes in Prayer.› If the conception of this work lacks clearness and intensity and the composition is not perfect in harmony, there is everything to be found there which study and deftness of handling could supply. The influence of Poussin is plainly discernible in all his works, but he has also all the excellencies of the Dutch school, and is perhaps most successful as a portrait painter. His own portrait, engraved by Edelinck, is in the Louvre, where also may be seen his ‹Philip the Apostle›; ‹The Last Supper›; ‹Incidents from the Life of Saint Gervasius and Protasius›; ‹Portrait of Richelieu.› His ‹Adam and Eve Weeping Over the Death of Abel› (1656) is in the Imperial Gallery at Vienna. Consult Gazier. ‹Philippe et Jean-Baptiste Champaigne› (1893).

PHILIPPEVILLE, fē-lēp-vēl, Algeria, a seaport and the capital of an arrondissement in the department of Constantine; on the Gulf of Stora. It has a fine harbor, protected by two moles, one 1,310 feet long and the other 4,590 feet. The town is modern, a large part of it was built since 1838 on the site of the ancient Rusicada. It has manufactories of cork, leather and also a large distillery. Iron mines and marble quarries are in the vicinity. There is an extensive trade in grain, fruits, tobacco, cotton, cork and leather. Pop. 16,000.

PHILIPPI, fē'lēp-pē, **Felix,** German dramatist: b. Berlin 1851. He entered journalism and in 1875 removed to Munich, where he wrote for different French and German periodicals, and after 1884 devoted himself to the writing of dramas. His plays are of the realistic type and he is one of Germany's most successful dramatists, his plays having also been successfully presented before German audiences in New York. Among them are ‹Der Advokat› (1884); ‹Dagmar› (1886); ‹Das alte Lied› (1889); ‹Wohlthäter der Menschheit› (1895); ‹Wer Wars?› (1896), etc.

PHILIPPI, fi-lĭp'ī, an ancient city of Macedonia, northeast of Amphipolis, now Filibedjik. Originally a Thracian city named Crenides, «the place of springs,» it was conquered by Philip II of Macedon, named after him, and exploited by him because of valuable gold mines in the neighborhood. Here in 42 B.C. the triumvirs, Antony and Octavian (later Augustus), defeated the republican army led by Brutus and Cassius, after a battle in which Brutus defeated the wing commanded by Octavian. Augustus made the city the Roman colony of Julia Augusta Philippi. Saint Paul seems to have visited Philippi twice and to have founded there the church to which he wrote the Epistle to the Philippians (q.v.). The city is now in ruins.

PHILIPPI, Engagement at. Upon the secession of Virginia Governor Letcher ordered Col. George A. Porterfield to proceed to Grafton and organize a command to hold the Baltimore and Ohio Railroad and guard the western frontier of the State against invasion from Ohio. The Union sentiment was strong and Porterfield with difficulty succeeded by 25 May 1861 in raising about 500 infantry and 175 mounted men. Governor Letcher had ordered him to make a descent on Wheeling and burn the bridges of the railroad should the Union troops endeavor to pass over it. The descent on Wheeling was impossible, but on the 25th he burned the railroad bridges between Farmington and Mannington. Gen. George B. McClellan, in command of the Union department of Ohio, including West Virginia, when informed of this ordered his troops to move to the Ohio and four regiments were crossed on the 27th and advanced from Wheeling and Parkersburg by the branch railroads uniting at Grafton. The bridges were repaired and the two columns joined at Grafton on the 30th. Porterfield abandoned Grafton on the 28th, retreating 15 miles south to Philippi, in Tygart's River Valley. Gen. T. A. Morris, with a brigade of Indiana troops, arrived at Grafton on 1 June and was given command of the Union troops in West Virginia. Upon his arrival he found that Col. B. F. Kelley, 1st Virginia (Union) regiment, under instructions from McClellan, had planned an expedition to surprise and capture Porterfield. Morris enlarged it by sending another column, under Col. Dumont, of the 7th Indiana, to co-operate with Kelley. Kelley had about 1,500 men of the 1st Virginia, 9th Indiana and 16th Ohio and Dumont, the 7th Indiana, part of the 6th, 14th Ohio and two guns of Barnett's Ohio artillery. Both columns made a night march, Kelley starting from Thornton and Dumont from Webster, on the railroad and converging on Philippi, which was to be attacked about 4 A.M. of 3 June. Dumont reached the hills overlooking Philippi soon after the appointed time and without waiting for Kelley opened fire with his artillery upon Porterfield's camp, taking it by surprise; in the midst of which Kelley came in from the other direction, but not soon enough to intercept the Confederate retreat. Porterfield, though surprised, by his coolness, courage and energy got his men off with but few casualties and the loss of some public stores and private baggage and retreated in good order to Beverly, some 30 miles southeast, and the Union troops occupied Philippi. Col. Kelley was the only person wounded on the Union side. Three Confederates were wounded, one, J. E. Hagner, by a cannon-ball, necessitating the amputation of a leg, the first amputation of the war. This was the first passage of arms in West Virginia; it greatly elated the Union men and gave an impetus to the dismemberment of Virginia and the formation of a new State; the secessionists were much depressed.

E. A. CARMAN.

PHILIPPIANS, Epistle to. Authorship. — That Paul wrote the Epistle to the Philippians is now asserted or conceded with practical unanimity by critics of all schools. The manifest sincerity of the letter, the Pauline characteristics displayed in a plainly unconscious and utterly inimitable way, the total lack of any plausible reason why such a letter should be forged, added to a chain of external evidence running back to Polycarp, these arguments seem to have decisively and finally answered the objections raised by some in the last century to its genuineness.

Church Addressed.— The church at Philippi was the first founded by Paul after he crossed from Asia to Europe on his second great missionary journey. He could not have worked in that city more than a few months, perhaps only weeks, before a riot was raised, and the magistrates commanded that Paul and his companion Silas should be beaten and imprisoned, in spite of the fact that they were Roman citizens. The next day, to be sure, they were released with a formal apology but they left at once to work in other places. However, in spite of the shortness of his stay, a church was founded which seems to have been more loyally and affectionately devoted to the Apostle and to have shared more largely in his own tender remembrance than any other of his churches. This is demonstratively shown by the fact that they repeatedly sent contributions to the Apostle's support, and by the character of this letter which is in large part a cordial acknowledgment of their loving generosity. Other than these personal relations there seems to have been little to discuss. The section of warning appears to have been written rather to guard against possible future evils. The only suggestion of any unfortunate condition in the church is the brief reference to a difficulty existing between two women, presumably important members of the church, and possibly ladies of rank and influence in the city. In no other Epistle does Paul find so little to correct, in no other so much to commend.

Occasion and Purpose.— As has been said, the primary purpose of this letter was to acknowledge a gift which the Philippian church had made to the Apostle in his imprisonment. It seems safe to infer that Paul was also answering a letter which the church had addressed to him in which there had apparently been some suggestion that Paul did not fully appreciate their affection and liberality, and also an expression of their fears as to the result of his imprisonment on his work as an Apostle. The Epistle assures them that their affection is fully reciprocated and their gifts appreciated, and further conveys the information that his bonds had helped rather than hindered Christian work in Rome. With these assurances go also some warnings and encouragements.

Contents.— After a salutation in which, though not in the body of the letter, Timothy is associated (i, 1, 2), Paul expresses his gratitude for their gift and his prayerfulness in their behalf (i, 3-11); assures them that the work of Christ is going on well in spite of his imprisonment (i, 12-26); urges them to unity, humility, a blameless life, and Christian joy (i, 27–ii, 18); promises to send Timothy as his representative, even though he hopes soon to visit them himself, and bespeaks a welcome for Epaphroditus the Philippian messenger, who had been very ill (ii, 19–30). With an abrupt turn, which has led some to think that it was occasioned by news of his enemies' activity which reached him as he was writing, he warns against the «Judaizers,» and offers himself as their example (iii, 1–16), adding a warning against the gross immorality of some (iii, 17–20). After various injunctions, special and general (iv, 1–9), he renews his expression of thanks for their gift (iv, 10–19), and ends with brief salutations (iv, 20–23).

Date and Place.— It is generally agreed that this letter was written during Paul's imprisonment at Rome rather than at Cæsarea, as some have thought. The majority of critics also probably rightly infer from some statements in the letter that it was near the end of the imprisonment, as Paul does not appear to have the liberty which he enjoyed for two years, and seems to expect his case to be finally settled very soon. There is no certain ground on which to assign the years to the events of Paul's life and chronologies vary more than five years, but it may safely be said that this was the last of the letters from his Roman prison, and was written about 60, possibly later, possibly somewhat earlier.

Bibliography.— Kennedy, H. A. A., 'The Epistle to the Philippians' (Expositor's Greek Testament, 1908); Lightfoot, J. B., 'Saint Paul's Epistle to the Philippians' (1869); Moule, H. C. G., 'The Epistle of Paul the Apostle to the Philippians' (Cambridge Greek Testament, 1906); Vincent, M. R., 'Commentary on the Epistle to the Philippians' (International Critical Commentary, 1897).

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PHILIPPIC, the title applied to the remarkable speeches made by Demosthenes, the greatest of Attic orators, against Philip of Macedon. The invective of these famous orations is so powerful as to render them unique, and the term philippic has since been applied to any damnatory and vituperative public address. Thus, Cicero termed philippics those orations of his which drove Mark Antony from Rome and compelled the Senate to prosecute the war against him after the murder of Julius Cæsar.

PHILIPPINE (fĭl'ĭp-ĭn) **COMMISSION.** See Philippine Islands.

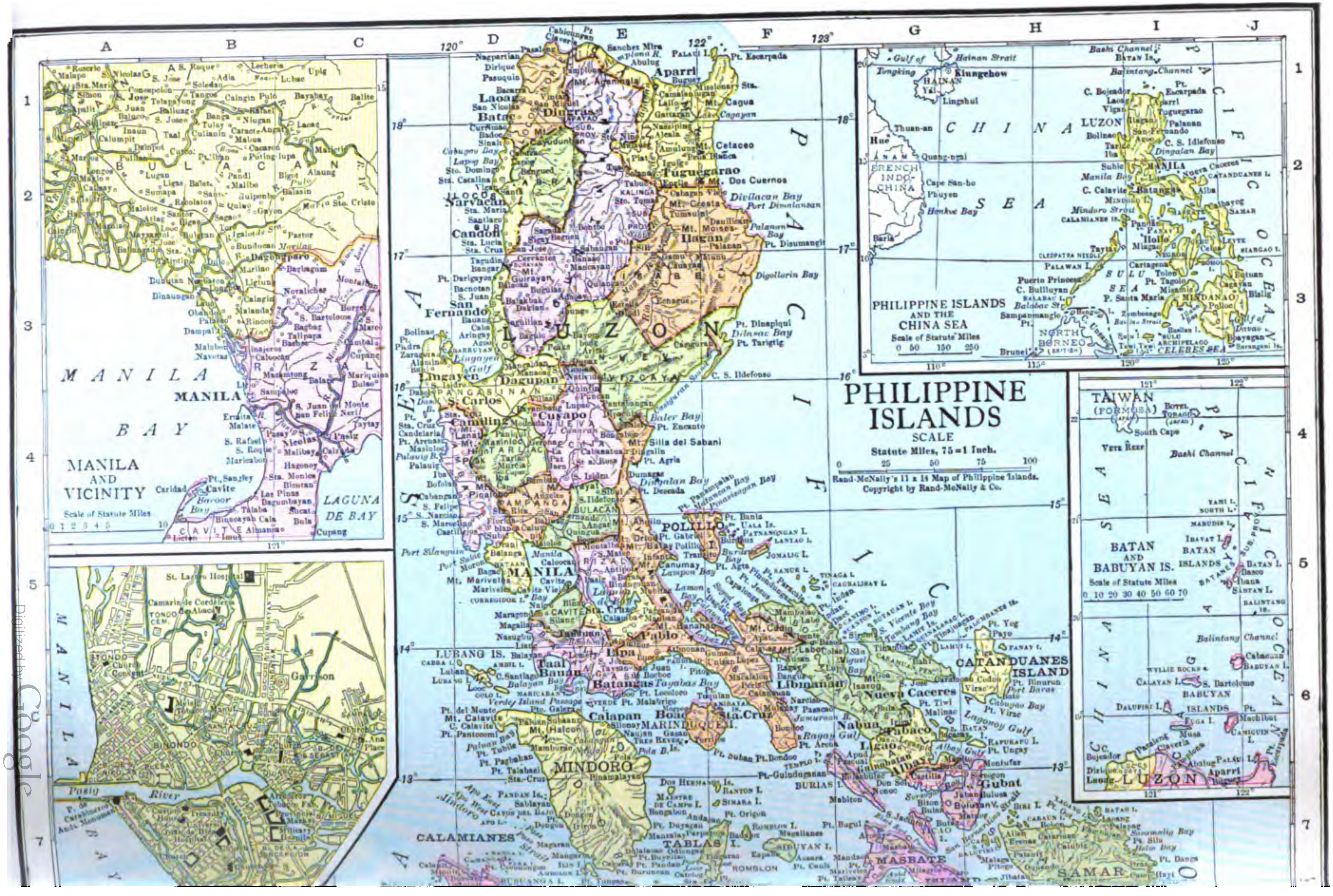
PHILIPPINE (fĭl'ĭ-pĭn, pēn, or pīn) **ISLANDS. Geographical Position and Area.** — The Philippine Islands lie approximately between 21° and 4° north latitude and 116° and 128° east longitude. The accompanying diagram gives their position relative to the neighboring countries. This shows that while they are not in direct line with the best developed transportation lines along the Asiatic Coast, yet they are not far distant from Hongkong, the shipping centre of the region. Previously most of the trade with Europe and America was carried on by transshipment through Hongkong, but recently several lines plying between the west coast of north America and Manila make this city a calling port either before or after Hongkong. The islands have a direct monthly service to Europe by the Spanish mail. Also a line of steamers plying between Asiatic ports and Australia call at one or more ports of the Philippines.

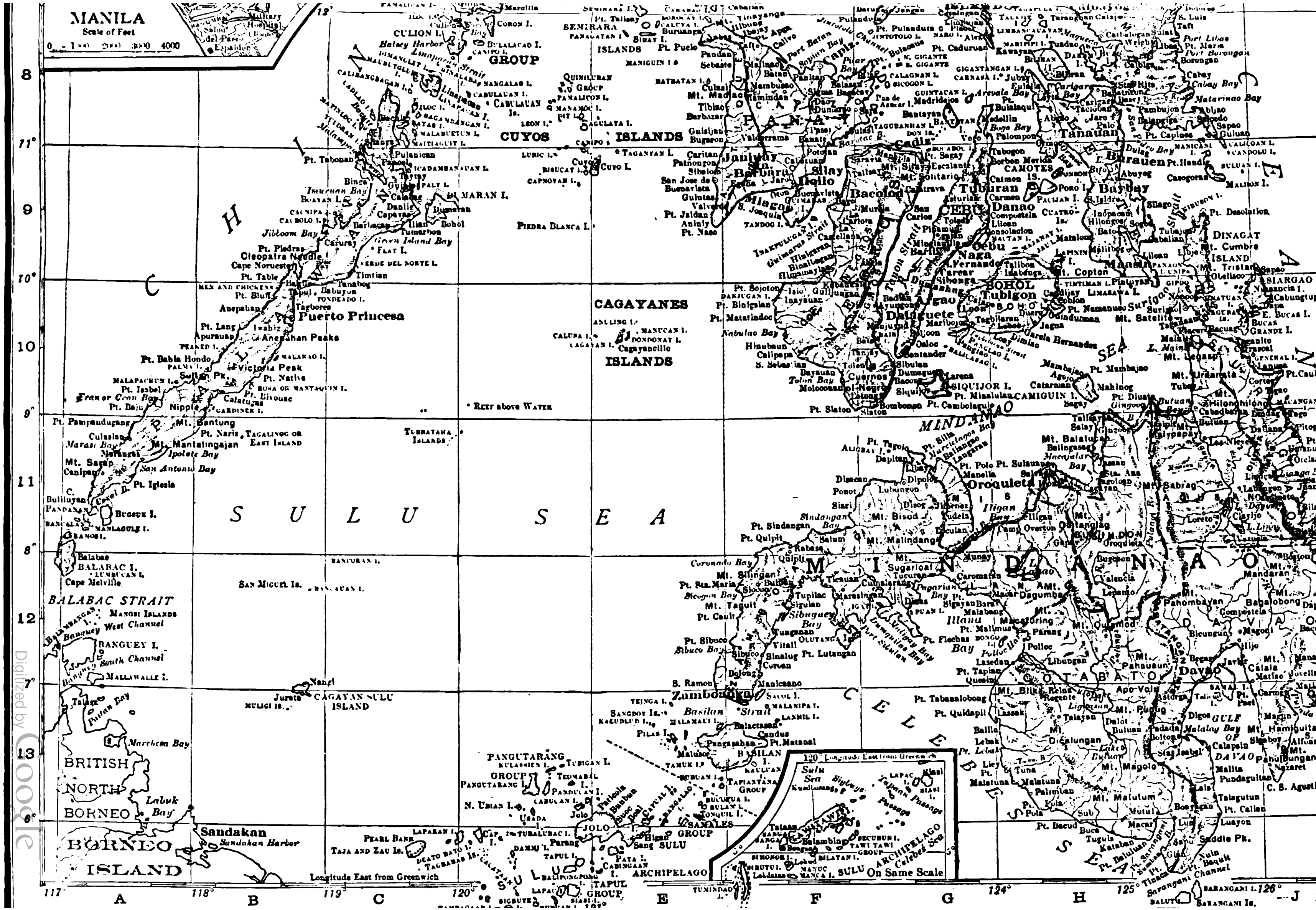
The area of the Philippines, while not accurately determined, is estimated to be about 120,000 square miles. They are about the size of the State of New Mexico or almost exactly twice as large as the four States of Maine, New Hampshire, Vermont and Massachusetts.

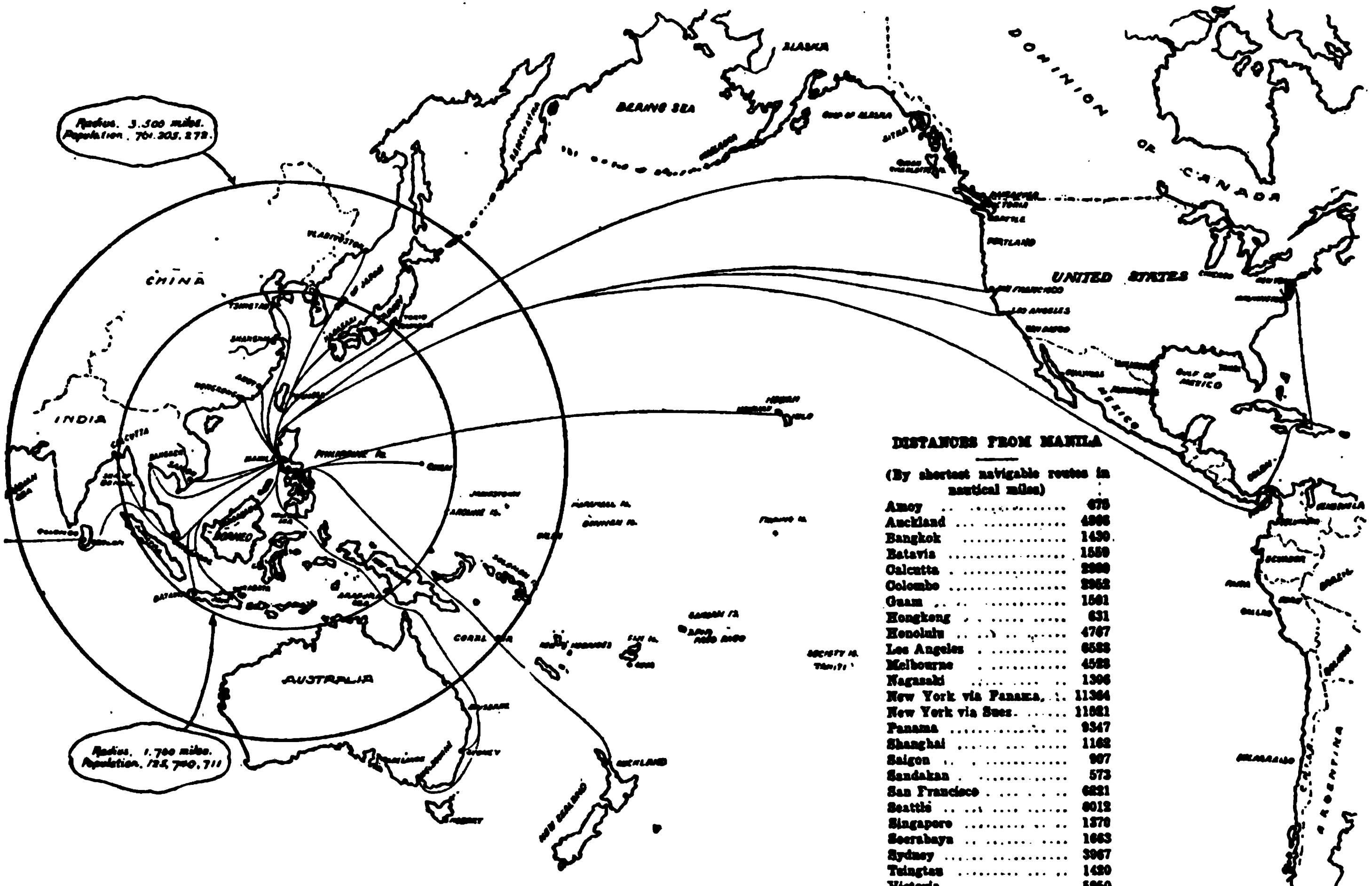
Physical Features.— The Philippine Archipelago is made up of some 1,200 islands separated from each other by narrow channels. The largest of these with their approximate areas in square miles from the north to the south are as follows: Luzon, 43,000; Mindoro, 4,000; Samar, 5,200; Leyte, 3,800; Panay, 4,700; Negros, 4,800; Cebu, 1,600; Palawan, 4,300; Mindanao, 45,500. The islands are mountainous in nature; the larger ones have more or less continuous mountain ranges which extend in the direction of the longest axis. In some cases these ranges are nearer one side of the islands than the other; in others, large river valleys separate two parallel mountain ranges. The peaks are volcanic in origin. Only one of these reach an altitude of about 10,000 feet. There are recorded 50 volcanoes, a number of which are more or less active. Limestone deposits, often crystallized by volcanic action, occur scattered throughout the islands, especially along the coast. In some portions, large areas of stratified volcanic tufts exist.

While there are many small streams which in the rainy season are mountain torrents, there are only a few large rivers. Some of these are navigable for small draft steamers, lighters and canoes, and thus play an important rôle in the development of the valleys in which they lie. The Cagayan River in the northern part of Luzon is about 168 miles in length and drains an intermontane area of some 16,000 square miles. The Agno River drains the mountainous region in north central Luzon. The Pampanga River drains a large area of central and north central Luzon and enters tidewater at the north end of Manila Bay. The Pasig River, at the mouth of which Manila is situated, is the outlet of Laguna de Bay (a fresh water lake) and facilitates trade by small steamers between Manila and the rich region on the shores of the lake. The Mindanao River, the chief river of the island of that name, is the largest river in the archipelago. The lowest third is navigable for small draft steamers, and this bids fair to play an important part in the development of its basin, which is as yet little utilized.

Climate.— The insular nature of the Philippines exerts an important influence on the temperature and ameliorates what might otherwise be an extremely unhealthy climate. The climate of Manila is divided into seasons, viz., the rainy season (June to November); the cool dry season (December to February); and the hot dry season (March to May). For nine months of the year the nights are comparatively cool, for the remaining three months there are only a few excessively hot nights. At Manila the annual mean is 80°, the January mean, 77°, and the June mean 82°. The highest recorded temperature is a little over 100°, and the lowest a little under 60°. The


PHILIPPINE ISLANDS
SCALE
Statute Miles, 75=1 Inch.
0 25 50 75 100
Rand-McNally's 11 x 14 Map of Philippine Islands.
Copyright by Rand-McNally & Co.
MANILA AND VICINITY
Scale of Statute Miles
PHILIPPINE ISLANDS AND THE CHINA SEA
Scale of Statute Miles
BATAN AND BABUYAN IS.
Scale of Statute Miles
TAIWAN (FORMOSA)
LUZON
MINDORO
CALAMIANES
TABLAS I.
MASBATE
SAMAR
CATANDUANES ISLAND
POLILLO
MANILA
MANILA BAY
LAGUNA DE BAY
BULACAN
RIZAL
CAVITE
PACIFIC OCEAN
CHINA SEA
FRENCH INDO-CHINA
NORTH BORNEO (BRITISH)
MINDANAO
CELEBES SEA
SULU SEA
A B C D E F G H I J
1 2 3 4 5 6 7


MANILA
Scale of Feet
0 1000 2000 3000 4000
SULU SEA
CHINA SEA
CELEBES SEA
MINDANAO SEA
MINDANAO
PANAY
NEGROS
CEBU
BOHOL
LEYTE
PALAWAN
CULION I.
CORON I.
BUSUANGA
Halsey Harbor
Linapacan Strait
CALAMIAN GROUP
CUYOS ISLANDS
CUYO I.
SEMIRARA ISLANDS
CAGAYANES ISLANDS
CAGAYANCILLO
Puerto Princesa
Anepahan Peaks
Victoria Peak
Mt. Mantalingajan
Cleopatra Needle
Balabac I.
BALABAC STRAIT
BANGUEY I.
BRITISH NORTH BORNEO
BORNEO ISLAND
Sandakan
Sandakan Harbor
Labuk Bay
Marudu Bay
Iloilo
Bacolod
Dumaguete
Tagbilaran
Tubigon
Siquijor I.
Camiguin I.
Surigao
Dinagat Island
Siargao
Mt. Apo
Davao
Davao Gulf
Cotabato
Illana Bay
Zamboanga
Basilan Strait
Basilan
Jolo
Sulu Archipelago
Tapul Group
Tawi Tawi
Pangutarang Group
Cagayan Sulu Island
Tubbataha Islands
Reef above Water
Piedra Blanca I.
San Miguel Is.
Sarangani Is.
Pt. Tinaca
Mt. Matutum
Iligan Bay
Oroquieta
Misamis
Butuan
Cagayan
Dapitan
Sindangan Bay
Pt. Sibuco
Sibuguey Bay
Dumanquilas Bay
Polloc Harbor
Tanauan
Tacloban
Ormoc
Baybay
Sogod Bay
Maasin
Abuyog
Panaon I.
Guimaras Strait
Tañon Strait
Capiz
Antique
San Jose de Buenavista
Masbate
Samar
Longitude East from Greenwich
On Same Scale
117° 118° 119° 120° 121° 122° 123° 124° 125° 126°
12° 11° 10° 9° 8° 7° 6°
A B C D E F G H J
8 9 10 11 12 13


DOMINION OF CANADA
UNITED STATES
MEXICO
ALASKA
BERING SEA
CHINA
INDIA
AUSTRALIA
Radius. 3,500 miles. Population. 701,305,272.
Radius. 1,700 miles. Population. 125,790,711

DISTANCES FROM MANILA

(By shortest navigable routes in nautical miles)

Amoy	675
Auckland	4966
Bangkok	1430
Batavia	1550
Calcutta	2990
Colombo	2952
Guam	1501
Hongkong	631
Honolulu	4767
Los Angeles	6533
Melbourne	4528
Nagasaki	1306
New York via Panama	11364
New York via Suez	11621
Panama	9347
Shanghai	1162
Saigon	907
Sandakan	573
San Francisco	6221
Seattle	6012
Singapore	1370
Soerabaya	1663
Sydney	3967
Tsingtau	1420
Victoria	5960
Vladivostock	1912
Yokohama	1757
Sourabaya	1663

MANILA—THE KEY PORT OF THE ORIENT
Showing Main Steamship Routes and Vast Fields of Production and Consumption with Relation to which Manila holds an unequalled Strategic Position.

above figures give a fair idea of the temperature condition through the islands at or near sea-level, though interior points and points farther north show greater oscillations in temperature, and those nearer the equator less oscillations. At high altitudes the climate is much lower. Thus at Baguio (altitude of station 4.777), formerly the official summer capital, now a summer resort, the mean annual temperature is near 65°, the mean maximum, 77°, and the mean minimum, 53°. The mean annual rainfall varies from less than 40 inches to over 120. Without going into the causes that produce the variations in rainfall in different parts of the islands, it is sufficient to state that they have been divided into different zones as follows: (1) Zone of very definite rainy and dry seasons: mainly the western coast of northern and central Luzon, western coasts of Mindoro and Panay and the Calamianes group. (2) Zones of long rainy season and short dry season. The northern and western coasts of Luzon, the central Visayans and northern Mindanao. (3) Zones with more or less uniform distribution of rainfall over the whole year: the southeastern end of Luzon; the eastern Visayans, eastern and southern Negros and Panay, the eastern and southern coast of Mindanao and the Jolo group.

In the summer and autumn months the rainfall is abundant throughout the archipelago. The winter or northeast rainfall is, generally speaking, abundant in zones 1 and 2. The spring rainfall in the months of March, April and May, due to local disturbances, occurs in all zones but is most abundant in zone 3. The different classes of rainfall are important because they determine to a great extent the classes of crops that can be raised most successfully in the different parts of the islands.

The typhoons, or baguios as they are locally called, are cyclonic winds that cause annually great destruction to growing crops, shipping, and buildings of all kinds. Sometimes when most severe they are accompanied by heavy rains, and these flood the streams and lowlands, thus adding to the loss of property and lives. The study of the history of these storms has been carried on for years by the Weather Bureau in the Philippines, which, aided by a large number of stations throughout the islands, can predict with great certainty the approach of a typhoon. The warnings of this bureau have for years saved large sums of money to the shipping industry, not only by the Philippines, but of the neighboring Asiatic coast as far north as Japan. The reader is referred to the publications of the bureau for an extended description of these storms. It is sufficient to state here that southern Mindanao and the Jolo group are practically free from them, that they generally originate to the east and southeast of the archipelago, have a general northwest trend and occur most frequently in the months of July, August and September.

Population and Inhabitants.— The census of 1903 gave the population as 6,975,073. A recent estimate on the basis of the electoral vote as furnished by the Bureau of Insular Affairs gives the total population at 9,503,271. See following table:

ESTIMATED POPULATION BY PROVINCES.

Class A.— Provinces in which the governor, other members of the provincial board, and representatives in the legislature are elected by popular vote:

	LUZON GROUP	Christian	Mohammedan	Pagan	Total
1.	Batanes	8,685	....	....	8,685
2.	Cagayan	187,672	....	4,750	192,422
3.	Isabela	94,763	....	3,985	98,748
4.	Ilokos Norte	184,748	....	698	185,446
5.	Ilokos Sur	167,435	....	3,442	170,877
6.	Abra	48,488	....	16,682	65,170
7.	La Unión	148,347	....	112	148,459
8.	Pangasinan	533,871	....	1,154	535,025
9.	Nueva Ecija	167,250	....	776	168,026
10.	Tarlak	165,891	....	1,847	167,738
11.	Zambales	106,862	....	3,772	110,634
12.	Batáan	49,526	....	1,741	51,267
13.	Pampanga	268,602	....	1,476	270,078
14.	Bulakan	250,626	....	623	251,249
15.	Manila City	266,108	117	21	266,246
16.	Rizal	177,687	....	2,840	180,527
17.	LaLaguna	175,354	....	47	175,401
18.	Cavite	157,465	5	7	157,477
19.	Batangas	286,641	2	....	286,643
20.	Tayabas	186,860	....	5,380	192,240
	(a) Subprovince of Marinduque	61,812	....	....	61,812
21.	Ambos Camarines	286,788	....	6,224	293,012
22.	Albay	241,873	....	1,109	242,982
	(a) Subprovince of Catanduanes	49,172	....	3	49,175
23.	Sorsogón	146,419	....	23	146,442
	(a) Subprovince of Masbate	54,608	....	....	54,608
	Total	4,473,553	124	56,712	4,530,389
	BISAYAN GROUP				
1.	Capiz	280,614	....	6,313	286,927
	(a) Subprovince of Romblon	66,048	....	65	66,113
2.	Iloilo	448,123	1	6,787	454,911
3.	Antique	156,549	....	3,321	159,870
4.	Negros Occidental	409,893	....	4,220	414,113
5.	Negros Oriental	192,743	....	15,038	207,781
	(a) Subprovince of Siquijor	57,421	....	....	57,421
6.	Cebú	727,943	12	....	727,955
7.	Samar	323,745	67	1,420	325,232
8.	Leyte	478,480	....	....	478,480
9.	Bohol	307,911	3	....	307,914
	Total	3,449,470	83	37,164	3,486,717
	MINDANAO GROUP				
1.	Misámis	172,348	3,797	983	177,128
2.	Surigao	112,973	17	4,650	117,640
	Total	285,321	3,814	5,633	294,768

SPECIAL GROUP	Christian	Mohammedan	Pagan	Total
1. Mindoro	51,592	....	12,185	63,777
2. Palawan	42,056	2,940	20,135	65,131
Total	93,648	2,940	32,320	128,908

Class B.— Provinces in which the governor, other members of the provincial board and representatives in the legislature are appointed by the governor-general.

MOUNTAIN PROVINCE	Christian	Mohammedan	Pagan	Total
1. Apayao	350	....	28,500	28,850
2. Kalinga	250	....	78,200	78,450
3. Bontok	986	....	60,514	61,500
4. Ifugao	120	....	129,380	129,500
5. Lepanto-Amburayan	15,750	....	43,684	59,434
6. Benguet	2,916	....	26,738	29,654
Total	20,372	....	367,016	387,388
Nueva Vizcaya	24,365	....	10,300	34,665
DEPARTMENT OF MINDANAO AND SULU				
1. Agusan	22,890	....	36,800	59,690
2. Bukidnon	9,808	542	47,800	58,150
3. Lanao	9,747	69,850	....	79,597
4. Zamboanga	49,732	43,687	31,450	124,869
5. Sulu	6,728	103,820	....	110,548
6. Cotabato	7,841	82,670	7,150	97,661
7. Davao	33,238	8,450	68,233	109,921
Total	139,984	309,019	191,433	640,436

SUMMARY.

CLASS A (ELECTIVE)				
Luzon provinces	4,473,553	124	56,712	4,530,389
Bisayan provinces	3,449,470	83	37,164	3,486,717
Mindanao provinces	285,321	3,814	5,633	294,768
Mindoro and Palawan	93,648	2,940	32,320	128,908
Total	8,301,992	6,961	131,829	8,440,782
CLASS B (APPOINTIVE)				
Mountain province	20,372	....	367,016	387,388
Nueva Vizcaya	24,365	....	10,300	34,665
Department of Mindanao and Sulu	139,984	309,019	191,433	640,436
Total	184,721	309,019	568,749	1,062,489
Class A	8,301,992	6,961	131,829	8,440,782
Class B	184,721	309,019	568,749	1,062,489
Total population	8,486,713	315,980	700,578	9,503,271

The foregoing table shows that of the population of the islands, 8,486,713 are classified as Christians, 315,980 as pagans and 700,578 as Mohammedans. The city of Manila has a population of 266,108.

It is generally conceded that the original inhabitants of the islands were Negritoes (Ætas) who belong to the eastern section of the Ethiopic division of the human race. To-day there are not more than 30,000 of these people scattered through the mountains of some of the larger provinces. The most civilized of them are more or less mixed with the Malays. They are pure or nearly savages, a nomadic people living on roots and products of the chase, though many of them, where in contact with the Christians, piece out their existence by trade in forest products, principally rattan, gums and resins.

After the Negrito invasion came the Malays, who gradually spread throughout the islands. The most progressive of the primitive races are the Igorrotes and allied tribes of the mountains of northern Luzon. Other mountain tribes of importance are the Tagbanuas of Palawan, the Manguianes of Mindoro and several of Mindanao. Besides the wild tribes or Pagans, as they are officially designated, are the Christians (Filipinos) and the Moros (Mohammedans). In point of numbers the three most important groups of Christian Filipinos are the Visayans of the Central Islands, the Tagalogs of central Luzon and the Ilocanas of the northwest coast of Luzon. Besides numerically important are the Ybanags of the Cagayan Valley, the Pampangans and Pangasinanes of the flat country north of Manila and the Bicols of southeastern Luzon. The languages of these several tribes are as a rule very different, but where they come in contact with each other they sometimes merge. This is especially the case with the Bicol, which has elements of both the Visayan and Tagalog languages. The Filipinos also occupy various points on the coast of Mindanao. Sometime previous to the discovery of the Philippines, Malay missionaries imbued with the Mohammedan faith carried their religion to the southern islands. This religion, tinctured with paganism, overran the Sulu Islands and parts of Mindanao and resisted successfully the attempts of the Spaniards to change it to the Christian religion.

Previous to the time of discovery of the Philippines there was more or less trade with the Chinese, but few, if any, had settled in the islands. Only after the Spanish conquest did any considerable number migrate to the islands. At present there are perhaps 100,000 Chinese in the islands, and a very much larger number of Chinese mestizos. Previous to the discovery Japanese colonies were made in certain parts of Luzon and left their imprint in racial features on the Tagalogs. Of late years considerable numbers of Japanese have immigrated to the islands. The most important colony is in the

Davao district of Mindanao, where they are engaged in the cultivation of hemp. The Spanish left their racial imprint on the population and Spanish mestizos form a considerable proportion of the population. The American influence in racial features has so far been almost negligible.

SPANISH RULE IN THE PHILIPPINES.

Magellan discovered the Philippine Islands in 1521. From this date until 1565 unsuccessful attempts were made by the Spaniards to establish themselves in the islands. In 1565 Legaspi landed at Cebu and the conquest of the islands began. Notable events during this period were as follows: (1) In 1570 the native city of Manila (Maynila) was captured by Legaspi, but it was not until the following year that the modern Spanish city was founded. (2) In 1574 Limahong, a Chinese pirate, attempted to capture Manila and later to establish himself in Pangasinan, but both attempts failed. (3) In 1581 the first bishop of Manila arrived and almost immediately there began conflicts between the civil and religious authorities. (4) In 1596 the first attempt to colonize the southern Philippines was made and a settlement established near Zamboanga, Mindanao. (5) In 1599 this settlement was destroyed and then commenced (1600) a series of Moro raids which menaced the northern islands until about 1800. During the period from 1565 to 1600 the conquest of all the large islands except Palawan and the Moro country was practically completed and the people for the most part were ready to be converted to Christianity. Manila had become the first city of the East. Trade was established with China, Japan, India and Malacca. The period from 1660–63 was marked by a series of conflicts with the Dutch and Moros. In the meantime, 1580, under Philip II, Portugal had been conquered by Spain and with this seizure all the rich Portuguese colonies of the East Indies came under the rule of the Spaniards with the centre at Manila. With the loss of the Spanish armada in the English Channel, the rule of the East passed to the English and Dutch.

The conflict between the Dutch and Spanish for possession of the East ended in the loss to Spain of most of the possessions to the south in the hands of the Dutch, although efforts of the latter to gain possession of the Philippines were without success. In 1640 Portugal freed herself from Spain and Spain lost the remainder of her possessions to the south. During this period the raids of the Moros continued. These pirates did much damage. This led to efforts on the part of Spain to conquer these warlike people, which resulted in the conquest of Jolo and the establishment of a stronghold at Zamboanga. In 1662 Koxinga, a Chinese pirate, demanded the surrender of Manila. This danger was so great that the Spaniards concentrated all their efforts to resist the threatened invasions and abandoned some of their strongholds in the south. The Chinese in Manila were suspected of being in the plot. They assaulted Manila but many were slain and the remainder left the city. The threatened invasion never was carried out for Koxinga died. The effects of the events cited above left Spanish prestige at a low ebb. Manila was no longer the principal commercial centre of the East and never again recovered that position. The century that followed from 1663–1762 has been described as one of obscurity for the Philippines. It was filled with conflicts between the civil and Church authorities. Corruption and violence went unrebuked. Efforts made by Spain to correct the abuses were for the most part without success. One of the courageous governors was killed by Church authorities. Commerce between South America and the Philippines was forbidden and that with Mexico greatly restricted for the benefit of the merchants of Spain. This economic policy nearly paralyzed trade. Moro piracy again became active. In 1762 the English captured Manila, but made no attempt to extend their conquest. By the Treaty of Paris in 1763, the Philippines were restored to Spain. From then to 1897 Spain was in undisputed control of the Philippines. The loss of her South American colonies between 1810–25 did not greatly influence her in the treatment of her remaining colonies — Cuba, Porto Rico and the Philippines. During this period undoubted progress was made in the industrial development of the Philippines. Some of the more progressive governors encouraged agriculture, favorable commercial legislation was passed and the opening of the port of Manila in 1837 was followed by increasing prosperity. The different religious organizations of the Church, which at first were devoted principally to religious and educational work, increased in power and wealth and often overshadowed the local rulers in different parts of the islands. The Spanish friars thus became powerful. Their paternal authority was often used to suppress radical views. The vast estates which they owned materialized their religious zeal. Contact with the outside world, through the opening of foreign commerce, brought to the Philippines, Spaniards who had been influenced by the revolutionary changes in Europe and agitation against the power of the friars began. The first newspaper made its appearance in 1822; a number of others followed in the forties. The first publications were Spanish and were followed later by periodicals printed in the local tongues. Though severely censored, these papers spread liberal ideas. In 1863 public schools were authorized. The friars were the local inspectors of the schools. However, the boys and girls who attended the schools grew ambitious for further progress. Parties for reform were started. One leader of these reform parties was José Rizal. He was educated by one of the Jesuit colleges, studied in Spain and traveled in other European countries. While there he wrote his first novel entitled 'Noli Me Tangere,' which dealt with his life in his Filipino home, and in this and a later novel he set forth his ideas of reform. This work made him enemies and on his return to the islands he was arrested and deported to Mindanao in 1892. While incipient revolts against the government and especially the friars previous to this time had been easily repressed, a more serious one in 1896 led to the arrest of many prominent and rich Filipinos and to an organized revolt under the leadership of Aguinaldo. This revolt was suppressed but not without great difficulty. Rizal returned to Manila in 1896 and though it was disproved that he had any part in the revolt he was sentenced to death and shot on 30 Dec. 1896. This execution only added flame to the feeling. It broke out afresh in 1897 and ended only on promises of reform. Aguinaldo and some of his followers agreed to leave the islands on the payment of 600,000 pesos. This they did on 27 Dec. 1897.

The Spanish-American War.— Because of misrule in Cuba, the people of the United States had long been in sympathy with the Cubans in their struggle for independence. On 20 April 1898, shortly after the battleship *Maine* had been destroyed in the harbor of Havana, the American Congress demanded that Spain should recognize the independence of Cuba. Spain refused and this was followed by war. On 1 May 1898 Admiral Dewey destroyed the Spanish fleet at Cavite. On 13 August Manila surrendered to American land forces. On 10 December the treaty of peace was signed at Paris. By the terms of this treaty Spain ceded to the United States for $20,000,000, the Philippine Islands. Before the capture of Manila, the insurrection of the Filipinos broke out afresh. Aguinaldo returned to the islands and became the leader. A provisional government was organized by the Filipinos and the independence of the archipelago was proclaimed. The expectation was that as soon as the Spaniards were defeated the Americans would withdraw. Disappointed in the terms of the treaty, Manila was attacked by the Filipinos on 4 Feb. 1899 and war was declared against the United States. This continued until March 1901 when the insurrection was broken by the capture of Aguinaldo, though it was some time after this before all the leaders surrendered.

THE PHILIPPINES UNDER AMERICAN RULE.

The policy of the United States has been from the beginning one of increasing autonomy for the Filipinos. The question of how rapidly this should be granted and how far it should go has been in constant dispute among experts on colonial history. The political parties of the United States represented two opposing views; the Republicans advocating caution and slowness in developing self-rule and the Democrats urging independence either at once or the fixing of the date in the near future. The time from the suppression of the insurrection to the present date can be divided into three periods, each of which marks an advance toward increasing autonomy.

1. The Rule of the Islands by a Commission.— In June 1900, President McKinley appointed a commission of five members, headed by William H. Taft, to legislate for the islands and to prepare a way for establishment of civil government. A little later three Filipino members were added to the commission. On 4 July 1901 civil government was established with changes from time to time in the personnel and lasted by commission until 15 Oct. 1907. The government was very liberal. It provided for practically self-government of the municipalities and part self-government for the 38 provinces of the islands. The central government for the purpose of administration was divided into four departments, viz.: interior, finance and justice, commerce and police and public instruction. Under these departments the various bureaus were organized.

Education.— The keystone to the arch of American rule has been education, not only by the establishment of a public school system and its extension as rapidly as the funds would permit, but education consciously or unconsciously among the Filipino employees in the various bureaus. As only a few of the educated Filipinos had a knowledge of Spanish, in the absence of a common native language the English language was decided upon as the basis of education. Some idea of the progress made in extending education is given by the following figures: Up to 1914 there had been established 3,913 primary schools, 278 intermediate schools and 44 secondary schools; in 1917 the number of schools had been increased to 4,274, 422 and 48, respectively. In 1914 there were 9,462 Filipino and 612 American teachers; in 1917 the Filipino teachers had increased to 13,377 and the American had decreased to 417. In 1917, out of an estimated total of 1,200,000 children of school age, 600,000 were receiving free elementary education. For the five years from 1912 to 1916 the school expenditures from all sources amounted to nearly $20,000,000, of which about $13,000,000 was furnished by the central government. This amounts to about 17 per cent of the total revenue of that government during the same period. Industrial, agricultural and physical training take a very prominent place in the educational system of the islands, much more so than in the public school system of the United States. No act of American rule in the Philippines has done more to convince the Filipino people of the unselfish purpose of the United States in remaining in the islands than the attitude toward education.

Reconstruction.— The early years of the rule of the commission were devoted mainly to various reconstruction problems. In many provinces a number of subordinate leaders of the insurrection refused to follow the leaders in submission. They kept up a period of raid and pillage that continued until late in 1906. The evil was overcome but not without some serious mistakes on the part of the government in handling it.

Shortly after the establishment an epidemic of cholera visited the islands and before it had run its course some 200,000 deaths were recorded. Smallpox, until checked by a resumption of general vaccination, claimed a large number of victims. Bubonic plague in the early days was a source of much worry to the officials. Diseases assailed animals as well. Surra and rinderpest nearly depopulated the islands of work animals. At first, with little trained help to combat these diseases and against strong opposition by many interests, by the establishment of rigid quarantine, these epidemics were brought more or less under control, so that to-day, with the exception of rinderpest, the islands are comparatively free of these diseases.

The purchase by the government of the lands held by the friars, the misuse of which was one of the main causes of discontent in Spanish days, did much to settle the intense feeling that the Filipinos had against the clerical ownership of these properties. Among other measures undertaken by the commission was the perfecting the civil service by strengthening the merit system upon which it was based;

guaranteeing interest at 4 per cent for a period of 30 years on the bonds of railway companies to attract capital to construct them; the improvement and beautifying the city of Manila; sanitary measures of all kinds throughout the islands; a reform in the currency, which gave a stable medium of exchange; the adoption of the metric system as the best means of standardizing the unstable system of weights and measurements, and establishing a postal savings bank connected with the Bureau of Posts, to encourage savings among the Filipinos.

In the meantime the American Congress recognizing the political ambitions of the Filipinos as legitimate and promising passed an act creating a Philippine assembly. This act provided that the appointed commission should remain as the executive head of the government and should share with an elected assembly the legislative powers. The act provided that the Philippines should be represented in the House of Representatives at Washington by two resident commissioners, but without votes. It further provided that bills introduced by either body of the legislative powers should have the consent of both bodies before it became a law, but that in case the two houses could not agree upon appropriation, the budget of the preceding fiscal period should remain in force. It also provided that the non-Christian people (the pagans and Mohammedans), being not ready for self-government, should not be subject to the government by the Christian people, hence the former were left to the exclusive jurisdiction of the commission. This leads to the second period of government under American sovereignty.

2. The Rule of the Islands by an Appointive Commission Composed of a Majority of Americans and an Elective Philippine Assembly.— The first assembly of the Philippine Islands was inaugurated on 16 Oct. 1907. The result of this dual legislative arrangement, one controlled by the Americans and the other by Filipinos, while it led to some friction between the two houses, especially in regard to appropriation bills, to the rejection of some measures advocated by one or the other bodies, was on the whole fairly successful. Changes in the personnel of the commission had continued from time to time.

Mr. Taft left Manila in December 1903 and Luke E. Wright was inaugurated as governor-general February 1904. He was succeeded by Henry Clay Ide on 12 April 1906. The next man to hold the office was James F. Smith, from 20 Sept. 1906 to May 1909, when he was followed by Cameron F. Forbes, who remained in power until October 1913.

The Presidential election of 1912 placed the Democrats in power by the election of President Wilson. As the Democrats were committed to an early independence, this changed radically the policy of the rule. President Wilson appointed Burton Harrison as governor-general. This inaugurates the third period of American rule in the Philippines.

3. Rule by an Appointive Commission Composed of a Majority of Filipinos and an Elective Assembly.— Governor-General Harrison in his inaugural address stated that it was the policy of President Wilson to appoint to the commission a majority of Filipinos. This gave the people of the islands control of both branches of the legislature. In his message to the assembly which convened in October 1913 he announced that no more American employees would at present be engaged. There began at once an exodus of many American employees and substitution of Filipinos for a number of important and many subordinate positions in the different bureaus. In the meantime the Democratic Congress pressed their measure to provide for an early independence of the islands by the passage of the so-called Jones bill. This bill at first fixed the date for the establishment of a republic at 1921. This act as finally approved, August 1916, did not include the date. The preamble reads as follows:

> "Whereas, It was never the intention of the people of the United States in the incipiency of the war with Spain to make it a war of conquest or for territorial aggrandizement; and
>
> "Whereas, It is, as it has always been, the purpose of the people of the United States to withdraw their sovereignty over the Philippine Islands and to recognize their independence as soon as a stable government can be established therein; and
>
> "Whereas, For the speedy accomplishment of such purpose it is desirable to place in the hands of the people of the Philippines as large a control of their domestic affairs as can be given them without in the meantime impairing the exercise of the rights of sovereignty by the people of the United States, in order that, by the use and exercise of popular franchise and governmental powers, they may be the better prepared to fully assume the responsibilities and enjoy all the privileges of complete independence."

It provided for an elective legislative assembly composed of a senate and house of representatives and a governor-general appointed by the President of the United States. By the act certain classes of laws passed by the legislature are subject to the approval of the President. The President also has the power to appoint a vice-governor, an auditor and the chief and associate justices of the Supreme Court. A bureau of non-Christian tribes is created which is more or less under the control of the governor-general. Another restriction limits the power of the newly-constituted assembly to limit the indebtedness to $15,000,000 at any one time, exclusive of the friar land bonds. With the exception of these and other restrictions, mainly to ensure constitutional rights to the people and the sovereignty of the United States, the assembly has large powers. With the creation of the machinery to carry out the provisions of this act, the people of the Philippine Islands under American sovereignty passed the fourth and probably last milestone on their march toward independence, for in April 1918, President Wilson publicly announced to a delegation of Filipinos appearing in Washington to ask for independence that the time was ripe for granting their desire.

Whatever may be the outcome, the American people can look with pride on the two decades of their rule in the Philippines. Sweeping aside all precedents there was inaugurated a new precedent in colonial rule. They found the islands in a deplorable backward and unsanitary condition; they have made them prosperous and fairly clean. They found a people with many languages and for the most part uneducated. They have succeeded in giving an opportunity of obtaining an education in a common language to more than half the people of school age throughout the islands.

In this place it is opportune to recount the progress made along various lines and to sum up the richness of the islands in natural resources.

The Vegetation.— The flora of the Philippines, like all tropical regions, is rich and varied. In the early days of American occupation provision was made for its classification, until to-day our knowledge concerning the flora of the islands has developed more rapidly proportionally to the time occupied in it than any other tropical region of the same area. Much remains to be accomplished. The great wealth of the natural vegetation consists in the forests. Soon after the occupation of the Americans a bureau of forestry was established, grafted onto the old Spanish organization. Whatever can be said against Spanish rule, it had kept the forest lands of the islands under government control, so that when the Americans took possession they found that practically 99 per cent of forested area was owned by the government outright. No other country in the world has such a large proportion of its forest land under government ownership. Steps were immediately taken to conserve and properly use this asset. To this end a comprehensive forest act was passed, which, with some changes, remains in effect to-day. It soon became apparent that forest asset was not sufficiently utilized. The islands were importing considerable quantities of timber that was believed could be obtained at home. In order to attract capital for the instalment of more modern methods of logging and milling an inventory of the forest resources was undertaken.

This inventory showed that vegetative classification of the islands to be as follows:

	Square miles
Virgin forests	40,000
Second growth forests	20,000
Grassland with scattered tree growth	48,000
Cultivated lands	12,000
Total	120,000

The amount of standing timber in the islands is estimated at about 200 billion board feet, or more than half the amount of standing timber in the famous yellow pine forest of the southern part of the United States. Moreover, the forests are comparatively simple in composition, and in heavy enough stands, to warrant the introduction of logging machinery. A large proportion of the stand consists of classes of timber that can be used as substitute for pines and oaks in all classes of general construction work. While it is true that the Philippines are as rich in fancy hardwoods as other tropical forests, yet the great richness of the forests consists in their heavy stands of comparatively light hardwoods that are easily worked and thus meet the demands of the general rather than the special markets.

The publications of the Bureau of Forestry that called attention to these facts soon succeeded in attracting capital, and in this way the lumbering industry of the islands has been rapidly developed, so that when the World War curtailed transportation the islands were found not only to be self-supporting in their requirements for the raw product of lumber, but for the first time in their history had a considerable surplus for the export trade. In 1910 the lumber production of the islands amounted to 176,758 cubic meters; in 1917 it had reached 366,891 cubic meters, or more than double.

The following trade figures showing the value of timber and lumber exported and imported gives some idea of the growth of the local industry in six years:

	Exports	Imports
1910	$30,000	$300,000
1916	565,000	170,000

All the timber is cut under the control of the Bureau of Forestry. The revenues obtained amount to about twice the cost of maintaining the bureau. Besides timber there are other forest products, such as dyewoods (sappan or Brazil wood mostly), tanbarks, rattan, bamboo, resins, gutta percha, but very little wild rubber.

Mineral Resources.— Comparatively speaking, the archipelago cannot be said to be very rich in mineral resources. While gold, silver, iron, copper and manganese ore are known to exist, only the gold mines are producing. Of recent years the developing of these has been greatly stimulated. In 1911 the production of gold amounted in value to about $150,000. This has steadily increased until in 1917 the production reached a little more than $1,500,000 in value. Coal, slightly inferior to that of the imported Australian and Japanese for steaming purposes, exists, but up to the present time the deposits have been little worked. Signs of petroleum are found in certain sections, but up to 1918 the evidence is not conclusive that the Philippines contain paying quantities of this valuable article.

Fauna, Wild and Domestic.— The islands are not rich in large mammals: wild hogs, deer, monkeys and a small buffalo called the timarau are the principal ones. Small mammals are more abundant. A manual of birds published in 1909 showed 739 known species recorded. There are probably many more. Of the many varieties of snakes, the python is the largest. Crocodiles are fairly abundant in some of the fresh waters and are sometimes seen along the coast, in the sea. There are many varieties of fish which constitutes an important item of food, and in the southern waters fishing for pearls is a profitable industry. The most important domestic animal is the water buffalo, called carabao. This has escaped domestication and in some islands, like Mindoro, there are wild herds of this animal. Rinderpest is the greatest enemy of the water buffalo, and while great attempts have been made to rid the islands of this disease, it is still present and is one of the principal reasons why the islands have never been able to raise enough rice to be self-supporting in this valuable cereal. The cattle industry which formerly was a profitable one is now at a low ebb because of the ravages of this disease. Other domestic animals have been imported.

Commerce and Agricultural Products.— Since the main exports of the islands consist of agricultural products, commerce and agricultural products are discussed together. In 1899 the total trade of the islands amounted to about $32,000,000. From that date there has been a steady increase in the foreign commerce. The following table will show this trade and its relation to the United States:

TOTAL FOREIGN TRADE.

TWELVE MONTHS ENDING 31 DEC.	Consignments from United States	Consignments from other countries	Total	Shipments to United States	Shipments to other countries	Total
1908	$5,101,836	$24,084,284	$29,186,120	$10,450,755	$22,150,317	$32,601,072
1909	6,445,331	24,639,088	31,084,419	14,726,513	20,197,824	34,924,337
1910	20,068,542	29,650,819	49,719,361	17,241,725	23,386,738	40,628,463
1911	19,156,987	28,867,420	48,024,407	19,827,030	24,760,261	44,587,291
1912	24,309,010	37,358,941	61,667,951	22,814,238	31,970,500	54,784,738
1913	26,676,261	26,636,525	53,312,786	16,434,018	31,338,938	47,772,956
1914	24,020,395	24,568,258	48,588,653	24,427,710	24,261,924	48,689,634
1915	26,381,069	22,931,115	49,312,184	23,653,211	30,159,793	53,813,004
1916	22,862,673	22,633,665	45,496,338	35,648,133	34,289,050	69,937,183
1917	37,620,648	28,176,383	65,797,031	63,234,359	32,369,948	95,604,307

From 1899 to 1916 the balance on trade was mostly against the islands, but the year 1916 left a net balance in favor amounting to more than $5,630,000. This increased in 1917 to $35,438,000.

Export Trade.— As shown by the above table the total value of exports increased from more than $29,000,000 in 1908 to nearly $66,000,000 in 1917. Manila hemp has from the beginning been the chief article of export, amounting to $46,807,780 in 1917. The banner year of hemp production in amount was in 1912, but the increased value of hemp put its value at more than double that of 1912. Manila hemp has long been considered the most valuable cordage fibre in the world. It is produced by a species of Musa, the same genus to which the banana belongs and looks very much like this plant. While efforts have been made to cultivate it in commercial quantities in other tropical countries than the Philippines, these attempts so far have been unsuccessful. The products of the cocoanut palm stand next to hemp in value of the exports. Previously the dried «flesh» of the nut under the name of «copra» was shipped mostly to Europe. Of late years, however, mills for extracting the oil have been erected and now the value of the shipments of cocoanut oil exceeds that of copra. The following table gives some idea of the growth of this industry and the share of the United States in this industry:

COCOANUT PRODUCTS.

	Copra shipments	Cocoanut oil shipments	Shipments to United States
1910	$10,639,049	$16	$638,783
1917	8,327,151	11,409,147	17,495,610

Thus, whereas the United States imported a very small proportion of the cocoanut products in 1910, in 1917 it absorbed nearly all of approximately $20,000,000 worth of these products. While the price of cocoanut products has remained nearly stable, the amount produced has nearly doubled. The scarcity of animal fats during the war has no doubt stimulated the use of cocoanut oil. Its principal use is in making the so-called coco butter. This valuable substitute for butter has been so favorably received that there will be a steady demand for it in the years to come. Sugar is the next in importance of the exports. The shipments of this product amounted to $7,224,385 in 1910, of which nearly all was made to the United States. This had increased to $18,587,593 in 1916; less than half was exported to the United States. Owing principally to the lack of tonnage the exports in 1917 decreased to $12,277,679. Tobacco is the last of the four principal exporting articles of the Philippines. The products shipped are in the form of leaf tobacco and cigars. In 1910 the exports amounted in value to $4,315,531, of which about one and a half million dollars worth went to the United States. In 1917 the total shipments amounted to $6,279,548, of which nearly four and a half million dollars worth were destined for the United States.

The value of the other principal products exported in 1917, besides lumber and gold, which have already been mentioned, are as follows:

Embroideries and hats	$1,964,659
Maguey	2,348,246
Pearl buttons and shells	260,536

Imports.— As shown by an above table the total value of the imports of the Philippines increased from $29,650,819 in 1910 to $65,797,031 in 1917. Of the above amount cotton goods imported stand first, having a value in 1917 of $18,787,002. Of this amount the United States furnished 70 per cent of the total. Iron and steel stand next in value with a total of $5,927,562 in 1917; approximately 85 per cent of the total importations of this commodity were furnished by the United States. Rice, the staple food product of the islands, stands third in the value of imports. In 1917 $5,390,731 worth of rice was imported. Efforts made to render the islands independent of importation of rice, while not entirely successful, have resulted in a steady increase in the production of this valuable product. Among the other products shipped into the islands that had a value in 1917 of more than a million dollars each are automobiles and accessories ($1,540,400); chemicals, etc. ($1,431,124); coal ($1,538,235); food products other than cattle and rice ($8,804,432); leather goods ($1,623,908); illuminating oil ($1,336,667); other oils ($1,457,441); silks ($1,980,593), and vegetable fibres, etc. ($1,535,905).

Agricultural Crops.— The following table gives the estimated values of the principal agricultural crops produced in 1917:

Corn	$38,820,000	Maguey	$2,481,000
Rice	36,250,000	Coffee	198,500
Hemp	30,361,000	Cacao	196,000
Cocoanuts	16,430,000		
Sugar	16,425,000	Total	$146,980,000
Tobacco	5,818,500		

Of these products rice, corn, cacao and coffee are practically all consumed at home.

PHILIPPINE ISLANDS

1 A Country Road in the Philippines

2 Mouth of the Pasig River, Manila

1 Well-cultivated fields, Basco (Batan Island)

2 A country scene in the Philippines

The others, as shown above, are mainly exported.

Transportation and Public Works.— No doubt much of the recent economic prosperity of the Philippines has been due to increased transportation facilities. In 1900 there were about 100 miles of railroad in the islands. To-day nearly 1,000 miles have been completed. The bonded indebtedness of the railroads amounts to $22,263,000 and the interest on this amount up to 4 per cent is guaranteed by the Philippine government. At the time of American occupation the highways built by the Spaniards had become impassable. Up to 1918 there had been built 2,318 miles of first class, 1,275 miles of second class and 2,105 miles of third-class roads. Re-enforced concrete structures consisting of schoolhouses, provincial buildings, markets, etc., to the number of 4,138 had been built up to 1918. There are in existence 7,370 durable bridges and culverts and 728 artesian wells have been driven. By furnishing pure potable water these latter have been very instrumental in reducing greatly the mortality of the regions in which they exist.

Revenues and Expenditures.—With the exception of the cost of maintaining an army in the Philippines by the United States, the islands have been self-supporting under American rule. During the year 1917 the total revenues of the Philippine government amounted to over $14,000,000, and the expenditures to nearly $12,000,000. The surplus on hand on 1 Jan. 1918 was over $6,000,000. The bonded indebtedness of the Philippine government, 30 June 1918, was $20,125,000. This includes the indebtedness of the cities of Manila and Cebu.

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PHILIPPINE LANGUAGES AND DIALECTS. Established languages, having an extensive printed literature, are the following: 1. Tagálog, with 1,500 printed books and pamphlets, 80 periodicals and 1,789,049 people making use of this tongue. 2. Bisaya or Visaya, (a) Panayan dialect, with 500 printed books and pamphlets, 21 periodicals and 1,289,142 people; and (b) Cebúan dialect, with 120 printed books and pamphlets, 17 periodicals and 1,848,613 people. 3. Ilóko, with 500 printed books and pamphlets, 40 periodicals and 988,841 people. 4. Bikol, with 300 printed books and pamphlets, 6 periodicals and 685,309 people. 5. Pampañgan, with 270 printed books and periodicals, 7 periodicals and 337,184 people. 6. Pañgasinan, with 100 printed books and pamphlets, 4 periodicals and 381,493 people. Thus we find the total number of printed books and pamphlets in these six leading tongues to be 3,290; the total number of periodicals, 175; the total number of people speaking one or more of these six established languages to be 7,319,631.

Semi-established languages having less printed literature than the foregoing are: 1. Bisaya (a) Samar-Leyte dialect, with 40 printed books and pamphlets, 6 periodicals and 601,683 people; and (b) Aklán dialect, with 15 printed books and pamphlets, 1 periodical and 137,772 people. 2. Ibanag, with 50 printed books and pamphlets, 3 periodicals and 136,134 people. The totals for this class are: Printed books and pamphlets, 105; periodicals, 10; number of people, 875,589.

Dialects having still less printed literature (1 to 10 books or pamphlets) are the following: Sulu, population 87,400; Bontok, population 29,258; Bagobo, population 5,600; Isinai, population 2,647; Ivatán, population 6,392; Gaddang, population 16,240; Magindanao, population 79,850; Tirurai, population 7,150; Ifugao (pure), population 86,000; Ilongot, subdivision Egóñgut, population 2,150; Kalamian, population 11,350; Tagbanúa, population 10,000; Tinggian, population 27,648; Igorot (a) Baúkok, population 12,000 and (b) Inibaloi, population 12,621; Lanao, population 58,350; Mangyan, subdivision Hampáñgan, population 5,250; Sambal, subdivision Iba Sambali, population 39,715; Subánun, subdivision Sindáñgan, population 10,000. The total population in this class, therefore, 509,621.

Dialects having no printed literature but of which brief vocabularies have been published are Atá (Dugbatang dialect), population 1,000; Bilá-an, 8,000; Gaddang (Yógad dialect), 5,000; Ifugao (subdivision Ifugao dialect), 45,000; Igorot (Kankanai dialect), 27,887; Ilongot (Ibilao or Abaká dialect), 2,000; Isamal, 983; Kalinga (Giná-an dialect), 6,000; Mandaya (Mansáka dialect), 5,000; Mangyan (a) Abra de Ilog dialect and (b) Báko dialect, each 2,000; Manóbo, 30,600; Sambal, subdivision Bolinao Sambali, 16,431; Subanun (a) Dapitan dialect, 8,450; (b) Buluan-Kipit dialect, 6,000; (c) Tukuran dialect, 7,000; Tagakaólo, 7,100. Total population in this class, 180,451.

Dialects known only through manuscript vocabularies or verbal information are Apáyao, used by 23,000 people; Atá, Tugauánum dialect, 500; Bagóbo (a) Giánga dialect, 1,200; (b) Obo dialect, 350 and (c) Eto dialect, 200; Bilá-an, Tagabili dialect, 2,400; Bisaya or Visaya, Mindanao dialects, 100,000; Bontok (a) Kadaklán-Barlig dialect, 8,000; (b) Tinglayan dialect, 20,000; (c) Dananao-Bañgáad dialect, 6,000; Bukidnon (a) Bukidnon dialect, 38,500 and (b) Banuáuon dialect, 10,000; Dumágat, 352; Gaddang (a) Maddukáyang dialect, 8,480; (b) Kataláñgan dialect, 2,000; (c) Iraya dialect, 2,000; Ibanag, Itávi dialect, 20,000; Ifugao, Lagáui dialect, 1,500; Igorot (a) Malaya dialect, 8,000 and (b) I-wáak dialect, 800; Ilongot (a) Italón dialect, 2,000; Kalinga (a) Dadayang dialect, 12,000; (b) Kalágua dialect, 12,000; (c) Nabayugan dialect, 2,000; (d) Mañgáli-Lubo dialect, 13,000; (e) Lubuágan dialect, 16,450; (f) Sumadel dialect, 6,000; Kuláman, 3,600; Mandaya (a) Mandaya dialect, 15,000; (b) Pagsúpan dialect, 5,000; Mangguáñgan dialect 2,500; Mangyan (a) Bañgon dialect, 2,000; (b) Bukil dialect, 1,000; Manóbo (a) Debabáon dialect, 3,000; (b) Libagánon dialect, 6,000; Palawan dialect, 1,940; Samal dialect, 78,700; Sanggil dialect, 2,450; Tagbanúa, Palúan dialect, 9,460; Yakán dialect, 7,290. Total number of persons using dialects of this class, 454,-672.

Negrito and Negroid groups number about 35,926; non-Negroid or semi-Negroid Hill Peoples, 46,015. It must be said in regard to many of these Negrito groups and hill tribes that their dialects remain practically unknown; and, if we add 8,000 for certain Atá and Bogobo groups, we reach a total of 89,941 for this class.

Foreign-born residents, a relatively small element, numbering 73,366 (according to statistics published at Manila in 1917), employ by preference Spanish, English and other languages of Europe and the mainland of Asia — languages which lie beyond the scope of the present article.

The foregoing list of native languages and dialects, fairly complete for the Christian peoples and for the majority of the sedentary and semi-sedentary non-Christian groups, is nevertheless unavoidably incomplete in its relation to the more primitive pagan peoples, and especially those living in migratory bands. The idioms of those peoples credited in the foregoing list with a considerable written literature are referred to as «languages,» while those of tribes having little or no written literature, and whose speech is therefore changeable and far from permanent, are regarded as «dialects.» Naturally, however, the term dialect is also used to indicate local variations from established forms of written languages. Professor Beyer, of the University of the Philippines, writes that «of dialects, in the latter sense, we have a multitude in the Philippines which are not recorded. For example, the spoken Tagálog of Batangas province differs considerably from that of Bulakán, while in Laguna, Cavite, Marinduque and other places there are still other Tagálog dialects. It is nevertheless quite permissible to speak of the Tagálog language, for the reason that the native newspapers and the more than 1,500 books and pamphlets printed in Tagálog have fixed the general character of the written speech.» Many of the Bisayan or Visayan dialects having developed extensive literatures of their own, are quite properly treated as separate languages.

Dr. Frank R. Blake and Mr. F. C. Cole have written conservatively: «The influence of Chinese trade, which has been carried on for several centuries, is found in the vocabularies of nearly all the tribes and the effect of the American and of the earlier Spanish occupation of the islands has been by no means inconsiderable.» These are comparatively unimportant influences. Let us consider now the chief formative influences that trace their origin to early waves of colonization through conquest. Dr. Blake thinks that the Philippine languages, so far as they are known, form a closely related group of tongues belonging to the Malayo-Polynesian family (compare writings of Churchill, W.); and it seems most likely that the cradle of the Malayo-Polynesians, whose ancient history is practically a sealed book, was on some of the numerous islands which it now inhabits, possibly some of the large islands in the vicinity of the Malay Peninsula (or upon the Malay Peninsula itself, more probably). These ancient progenitors of a race so typically seafaring in its preferences must have spread out in a series of waves or swarms. Crossing at first by means of their canoes over the comparatively short stretches of sea between the Malay Peninsula and the neighboring islands, they gradually pushed out adventurously until they had occupied almost all the land space of the Pacific Ocean. «Some of the islands,» Dr. Blake thinks, «they probably found unoccupied (but) in others they must have come in contact with an inferior black race similar to that inhabiting Papua and Australia, as is shown by the remnants of this race which are found pushed back into the interior mountain ranges of some of the larger islands, notably the Philippines.»

Evidently the oldest colonies — or, more strictly, independent settlements — were those of the Philippines, because these islands lay nearest to the birthplace of the Malay fortune-hunters. The Malay tongue, then, embracing the languages of the Malay Peninsula, of the Philippines, of the East India islands, of Madagascar, etc., is a branch of the Malayo-Polynesian linguistic family; and the Philippine idioms, dialects, or, as we have said above, «languages,» are as a matter of fact the local manifestations of the expression-impulse which must be studied sometime, for purpose of comparison, in southern islands of the widest oceanic areas.

Dr. Blake (see *Bibliography*) writes that, beginning at the extreme north of the Archipelago, the languages about which anything definite is known are as follows: Batan is the language of the Batan and Babuyan islands to the north of Luzon. On the island of Luzon, Tagálog, the most important and best known of the Philippine languages, is spoken from coast to coast, in the middle region of the island, in the latitude of Manila Bay. On the west coast its territory does not extend north of the bay, but on the east it reaches as far north as the province of Isabela. On the south and southeast it extends down into the land's end of Luzon, trenching on the domain of Bikol. In the region north and west of the Tagálog district a number of languages are spoken. Ibanag prevails in the northeast, in the valley of the Cagayan River; Ilokan occupies the north and west coasts, extending as far south as the Gulf of Lingayen, between which and Manila Bay are heard the Pangasinan, Tino or Zambal, and the Pampangan tongues. Various Igorot dialects are spoken in the highlands of the interior.

On the Visayan Islands and on the north and east coasts of Mindanao, Visayan (Bisayan) is spoken in a number of different dialects. Sulu is the Moro tongue in the islands which extend from Mindanao westward. Moro tribes of Mindanao, in the west and southwest of that large island, speak two dialects known as Magindanao and Malano. Of the other idioms spoken on Mindanao, only Bagobo and Tiruray are mentioned by Blake. The island of Mindoro forms the domain of the Mangyan tongue. The principal language of the Calamianes and the long narrow island of Palawan, which together form a chain stretching from Mindoro toward Borneo, is Tagbanwa. The tribes that speak these languages fall into three general groups, according to their religion. Those that speak Batan, Ibanag, Ilokan, Pangasinan, Zambal, Pampangan, Tagálog, Bikol, Visayan, Agutayan and Koyuvan are Christians, the Sulus, Magindanaos and Malanaos are Mohammedans; while the remaining tribes mentioned are still pagans. The three alphabets used by natives of the Philippines are: (1) That of the pagan Tagbanwas and Mangyans. (2) That of the Mohammedan tribes, namely, the Arabic alphabet with additional signs to denote peculiar native sounds. (3) The Roman alphabet introduced by Spaniards, in which are written all languages of the Christian tribes and all those dialects of pagan tribes which have been reduced to writing by Spanish missionaries. At the time of the Spanish conquest the chief tribes possessed alphabets that were practically identical with those of the Tagbanwas and Mangyans; but those ancient alphabets have been superseded so completely that, in the Mohammedan tribes, no trace of them has been preserved, and their use in the Christian tribes seems to have died out more than 150 years ago. «The archetype of these native alphabets seems to have been,» Blake observes, «of Indian origin. As in the Indian alphabets, every consonantal character without addition represents the consonant followed by the vowel *a*, the other vowels being indicated by secondary marks. There was no way of expressing a consonant without a following vowel.» The Roman alphabet, used in writing the native languages, was conformed to the peculiarities of Spanish orthography, but lately a number of improvements in spelling have been introduced, the most important being the use of *k* for *c* and *qu*, and *w* for consonantal *u*. To some extent the Philippine languages have been influenced by the languages with which they have come in contact. The vocabularies of Tagálog and Bisayan (Visayan), for example, contain a number of Sanskrit words. Again, the languages spoken by the Mohammedan tribes contain a number of Arabic words. The Christian tribes have adopted Spanish terms; a few Chinese words are heard in Tagálog; and, of course, «at present the various languages are being subjected to the influence of English, and English words will probably be more or less extensively borrowed.» The most important characteristics which the Philippine languages possess in common are given in the *Journal of the American Oriental Society*, Vol. XXVII, second half, pages 323–396.

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MARRION WILCOX.

PHILIPPINES, University of the, an institution for higher education founded by the legislature in 1908 at Manila. It comprises the College of Liberal Arts, College of Medicine, College of Law, Pharmacy School, College of Veterinary Science School of Education, and School of Fine Arts, and a College of Agriculture at Los Barros, Laguna. The institution is governed by a board of 11 regents, of whom five are appointed by the governor-general, and the remainder hold office ex officio. The annual enrolment is about 750.

PHILIPPITE, a mineral belonging to the group of Zeolites, formerly regarded as orthorhombic, but now ascertained to be monoclinic in crystallization. Crystals always twinned. Hardness, 4–4.5; specific gravity, 2.2; lustre, vitreous; color, white; translucent to opaque. Composition: $(CaK_2)Al_2Si_4O_{14}.5H_2O$. Occurs in vesicular cavities in old igneous rocks.

PHILIPPIUM, *in chemistry*, an element closely allied to cerium. Though described by Delafontain in 1888 as a newly discovered element, it was not until 1897 that it was acknowledged to be such by English chemists. Philippium has been found in gadolinite, samarskite and fergusonite. It appears in two sets of compounds, the philippous and the philippic, corresponding to a white acid and an orange oxide. The salts of the first series are colorless, quite stable, crystallize well, and correspond to the lanthenum and yttrium salts. Philippic oxide has a deep orange-red color. The constitution of philippium compounds remains to be established.

PHILIPPOPOLIS, Bulgaria, the second largest city of the country and once the capital of eastern Rumelia situated on the Maritza River, 80 miles southeast of Sofia, on the railroad connecting the latter city with Constantinople. It is well laid out; has fine parks and suburbs, and is the seat of an archbishop of the Eastern Church. There are several Christian churches and mosques, a college and a national library. The city is the chief commercial point of central Bulgaria, with a huge trade in silk, cotton goods, attar of roses, grain, rice, hides and tobacco. It is an ancient city of Thrace and has suffered much in the course of the centuries from the tide of war in which it was several times engulfed. In 1818 an earthquake well-nigh destroyed it and a disastrous fire occurred in 1846. Pop. 47,000.

PHILIPPOTEAUX, fē-lē-pŏ-tō, **Henri Emmanuel Félix**, French painter: b. Paris, 3 April 1815; d. there, 9 Nov. 1884. After studying his art under Cogniet he applied himself to the painting of battle scenes, and his canvases give a vivid and almost complete panorama of 19th century wars. His mastery of details and lively delineation of the clash and movement of combat are remarkable. Among his principal pictures are ‹The Evacuation of Moscow› (1835); ‹The Capture of Ypres›; ‹The Siege of Antwerp in 1792› (1838); ‹Louis XV Visiting the Battlefield of Fontenoy› (1840), in the Luxembourg; ‹The Battle of Rivoli› (1845); ‹Charge of the Chasseurs d'Afrique at Balaclava› (1859); ‹The Siege of Puebla› (1865); ‹The Meeting of Henry IV and Sully after the Battle of Ivry, 1590› (1875), now in the museum at Versailles; ‹Bayard on the Bridge of Garigliano, 1503›; ‹The Battle of Alma› (1875); ‹A Panorama of the Siege of Paris, 1870–71›; and several other war panoramas.

PHILIPPSBURG, Germany, a town in Baden on the right bank of the Rhine, 16 miles north of Carlsruhe, formerly a celebrated imperial fortress. In 1734 it was captured by the French under the Duke of Berwick (who lost his life here), and its fortifications were razed in 1800. Pop. about 2,500.

PHILIPPSON, fē'lēp-zōn, **Martin**, German historian: b. Magdeburg, Germany, 27 June 1846. He was eduacted at Bonn and at Berlin, became docent at Bonn in 1871, and in 1878 was appointed to the chair of history in the University of Brussels. A bitter controversy arose with the anti-German student body in 1890, and Philippson resigned his professorship. He wrote 'Geschichte Heinrichs des Löwen' (1868); 'Geschichte des preussischen Staatswesens vom Tode Friedrichs des Grossen bis zu den Freiheitskriegen' (1880–82); 'Das Leben Kaiser Friedrichs III' (1900); 'Kurfürst Friedrich Wilhelm von Brandenburg' (1879–1901), etc.

PHILIPS, fil'ĭps, **Ambrose**, English poet: b. Shropshire, 1675; d. London, 18 June 1749. He was graduated from Cambridge in 1696, and removed to London, where he became intimate with Addison and Steele. His 'Winter-piece,' published in the *Tatler*, first gained him recognition; his six 'Pastorals,' which appeared in Tonson's 'Miscellany' (1709), gained the praise of Tickell, but roused a bitter satirical attack from Pope. Some of his odes written to children contain really his best work, but their simplicity of diction earned for him the nickname «Namby-Pamby,» since become an adjective in general use. He established the *Free-Thinker* in 1718, and supported the government in its columns, later sat in the Irish Parliament for Armagh, was secretary to the lord-chancellor of Ireland in 1726, and judge of the Prerogative Court in 1733. His play, 'The Distrest Mother' (1712), adapted from Racine's 'Andromaque,' received high praise from the *Spectator*, but 'The Briton' (1722), and 'Humphrey, Duke of Gloucester' (1723), attracted little attention. Consult Johnson, 'Lives of the Poets.'

PHILIPS, Edward, English author: b. London, August 1630; d. there, about 1696. He was educated under the care of his uncle, John Milton, and studied for a time at Oxford. Later, with his brother, John (1631–1706), who had been Milton's assistant as Latin secretary to Cromwell's government, he joined the Cavalier party, which proceeding resulted in an estrangement from his uncle. He engaged in literary work, edited a volume of poems by William Drummond, and supported himself by literary hack work and tutoring in noble families. Subsequently he became reconciled to his uncle and was a warm admirer of his work. He wrote 'New World of English Words' (1658); 'Mysteries of Love and Eloquence' (1658); 'Theatrum Poetarum' (1675); 'Life of Milton' (1694), etc.

PHILIPS, Francis Charles, English novelist and dramatist: b. Brighton, Sussex, 3 Feb. 1849. He was educated at Brighton College, entered the army, where he served three years, became a barrister in 1884, and began writing novels and plays. His novel, 'As in a Looking Glass' (1885), was dramatized and played by both Sarah Bernhardt and Mrs. Beere. He collaborated in writing the plays 'A Woman's Reason'; 'The Fortune of War'; 'Papa's Wife'; etc., and among his numerous novels are 'The Dean and His Daughter,' dramatized 'Mrs. Bouverie'; 'The Luckiest of Three'; 'Men, Women and Things'; 'A Devil in Nun's Veiling'; 'A Full Confession'; 'My Varied Life' is a volume of reminiscences.

PHILIPS, George Morris, American educator: b. Atglen, Pa., 28 Oct. 1851. He was graduated from Bucknell University, Lewisburg, Pa., in 1871, and has been principal of the Pennsylvania State Normal School, Westchester, Pa., from 1881. He has published 'Astronomy' (1882); 'Natural Philosophy' (1884); 'Civil Government of Pennsylvania' (1893); 'Geography of Pennsylvania' (1895); 'Nation and State' (1907); 'The Silver-Burdett Arithmetics' (with Anderson).

PHILIPS, or **PHILLIPS, John**, English poet: b. Bampton, Oxforshire, 30 Dec. 1676; d. Hereford, England, 15 Feb. 1709. He was educated at Winchester and Oxford, and won his first literary success on the publication of his 'Splendid Shilling,' written in blank verse in imitation of Milton. His 'Cyder' was also an imitation, after Virgil's Georgics, and 'Blenheim,' which was a Tory celebration of Marlborough's victory, was written in reply to Addison's 'Campaign.' He is the only notable writer in blank verse between Milton and Thomson.

PHILIPS, Katherine Fowler, English poet: b. London, 1 Jan. 1631; d. there, 22 June 1664. She was married to Hector Philips in 1647 and afterward accompanied the Viscountess Dungannon to Ireland. On her return to London she became a member of the famous literary circle which included Jeremy Taylor and Sir Charles Cotterel and was known among them as «the matchless Orinda.» Her translation of Corneille's 'Pompée' was very successful and was acted in 1663–64. An unauthorized edition of her poems was printed in 1663 and her letters to 'Poliarchus' (Sir Charles Cotterel) were published in 1705. Consult Gosse, 'Seventeenth Century Studies' (1883).

PHILIPSBURG, Pa., borough in Center County, on the Mushannon Creek, and on the New York Central and Hudson River, the Pennsylvania, and the Pittsburgh and Susquehanna railroads, 40 miles northeast of Altoona. Great quantities of bituminous coal are mined nearby and there are also great deposits of clay in the neighborhood. Its industrial establishments include flour mills, foundries, planing mills, manufactories of hardware and tools, and machine shops. There are two sanatoria and it is also the seat of Cottage State Hospital. Pop. 3,585.

PHILIPSON, fil'ĭp-sŏn, **David**, American rabbi: b. Wabash, Ind., 9 Aug. 1862. He was graduated from the University of Cincinnati and from the Hebrew Union College there in 1883. In 1884–88 he was rabbi of the Har Sinai Congregation in Baltimore, and has since been in charge of the B'ne Israel Congregation, Cincinnati, and professor of homiletics in the Hebrew Union College there. He was president of the Central Conference of American Rabbis 1907–09 and has been a member of the executive committee since then. He was a consulting editor of the Jewish encyclopedia and is a member of the board of editors of the new Jewish Bible translation. He is prominently connected with various charitable and other associations and has published 'The Jew in English Fiction' (1889, 1902, 1911); 'Five Lectures on Cuneiform Inscriptions' (1890); 'Old European Jewries' (1894); 'The Oldest Jewish Congregation in the West' (1894); 'A Holiday Sheaf' (1898); 'Reminiscences by Isaac M. Wise' (1901); 'The Reform Movement in Judaism' (1907); 'Max Lilienthal, American Rabbi' (1915), besides many pamphlets.

PHILISTINES, fi-lis'tinz (Hebrew, Philisthiim), a people who appear to have settled in the coast plain of Canaan shortly before the arrival of the Israelites; whence they migrated is a question which historical and archæological research has as yet failed to resolve. Some historians trace their origin to the island of Crete, others hold that they came from the borders of Egypt, the land of Gerar. Their territory, called Philistia or land of the Philisthiim, gave, in after times, to the whole country at any period occupied by Israel the name it still bears, Palestine. They occupied four principal cities from the neighborhood of Joppa on the north, southward to the Egyptian border, namely, Azotus (Ashdod), Gaza, Ascalon (Ashkelon) — these on the Mediterranean Coast; and Gath and Ekron inland. These five cities, under as many lords, were always confederated for war, offensive or defensive, against foreign enemies. Throughout the period of the Judges in Israel this confederacy was at almost continual war with the Israelites, and despite the consolidation of the military resources of the Hebrew people under the kingship, the ascendency of Philistia seemed assured before the close of Saul's reign. But David carried the war into the Philistine country and with notable success; his son Solomon completely subdued Philisthiim and made the country tributary to Israel. Even after the division of Israel into two kingdoms the Philistines, though they were a serious menace to the northern kingdom, for some time did not dare to attack the kingdom of Judah; but in the reign of Ahez, the 11th of the Judaite kings, they reconquered some of their ancient possessions. In the time of the Maccabees the Jews once more asserted mastery over their ancient rivals; afterward Philistia was annexed by Pompey to the Roman province of Syria. The origin of the Philistines is a much vexed question. That they were of Semitic race or that they were at least a semitized people, has been with strong probability inferred from such remains of their language as are extant. First, the names of their cities, which are unquestionably semitic; but are the names we have the very names given to the cities themselves, or are they names given them by their Semitic neighbors? If the question had to be resolved by means solely of the names given in the Hebrew sacred books, the solution would be open to doubt; but the modern study of the Assyrian monuments has discovered a great many other proper names of persons and places — to say nothing of analogies in religious beliefs; and these give abundant proof that the Philistines were, at least in language, Semitic.

PHILISTINISM, a term of contempt to designate the manners, habits of thought, and views of life held by persons of inferior culture. The word Philistine (Philister) was first employed in some such sense as this by German university students; for them all classes outside of university circles are *Philister.* Matthew Arnold attributes Philistinism to the whole middle class of the English people, who are, he says, ignorant, strenuously obstructive and narrow-minded. But Sir Leslie Stephen recognized in the use of the word the very note of Philistinism; «Philistine,» he says, «is a term of contempt applied by prigs to the rest of their species.»

PHILISTUS, a Greek historian who resided at the court of Dionysius the Elder, tyrant of Syracuse (430–367 B.C.), and wrote a history of his life. The work has not come down to our time; it is quoted by Pausanias.

PHILLEO, fĭl-ē'ō, **Prudence Crandall,** American philanthropist: b. Hopkinton, R. I., 3 Sept. 1803; d. Elk Falls, Kan., 28 Jan. 1889. In 1831, with the aid of several residents, she opened at Canterbury, Windham County, Conn., a school for young ladies. She received a colored pupil, and thereby aroused the disapproval of her Canterbury neighbors, who declined to help sustain the school if the objectionable member were retained. Upon her refusal to dismiss the colored pupil, the white scholars left, and she then determined to teach blacks only. In April 1833 her new enterprise was begun. Upon petition of the townspeople, an act was passed by the legislature making unlawful the establishment of young ladies' schools for colored pupils not resident in the State, and in the succeeding autumn she was twice tried and convicted. In 1834 the judgment was reversed by the Supreme Court of Errors. During the two years struggle with the town of Canterbury, she was subjected to ostracism and spiteful persecution, and her house was even set on fire. Soon afterward she was married to Rev. Calvin Philleo, and with him removed from Connecticut. Consult May, ‘Recollections of the Anti-Slavery Conflict’ (1869).

PHILLIMORE, fĭl'ĭ-mōr, **John George,** English jurist: b. Oxfordshire, 5 Jan. 1808; d. Shiplake House, Oxfordshire, 27 April 1865. He was educated at Westminster and Oxford, was called to the bar of Lincoln's Inn in 1832, became eminent in his profession and member of Parliament in 1852–57. He published ‘Introduction to the Study and History of Roman Law’ (1848); ‘Private Law Among the Romans: Principles and Maxims of Jurisprudence’; etc.

PHILLIMORE, Sir **Robert Joseph,** Engglish jurist, brother of J. G. Phillimore (q.v.): b. London, 5 Nov. 1810; d. Henley-on-Thames, 4 Feb. 1885. He was educated at Oxford, was called to the bar in 1841 and rapidly came to the front in his profession. He sat in Parliament for Tavistock 1852–57; in 1867 was appointed judge of the High Court of Admiralty, and in 1871–72 was judge-advocate-general. He was knighted in 1862 and created a baronet in 1881 and two years later resigned his judgeship. His works include ‘Commentaries on International Law’ (1854–61); ‘The Ecclesiastical Law of the Church of England’ (1873); and a translation, with notes, etc., of Lessing's ‘Laocöon’ (1874).

PHILLIMORE, Sir **Walter George Frank,** English jurist: b. London, 21 Nov. 1845. He was educated at Oxford, became a barrister of the Middle Temple in 1868 and received the patent of precedence in 1883. He was a judge of the Queen's Bench Division of the High Court of Justice 1897–1913 and was one of the Lords of Appeal 1913–16. He is vice-president of the English Church Union. He edited Robert Phillimore's ‘Ecclesiastical Law of the Church of England’ and ‘International Law,’ and wrote ‘Book of Church Law.’

PHILIP, fĭl'ĭp, **John**, Scotch artist painter: b. Aberdeen, Scotland, 19 April 1817; d. London, 27 Feb. 1867. While a boy in distressing poverty, he cultivated his natural taste for painting and at the age of 13 received instruction from a local portraitist. Before his 15th year he produced portraits which won for him the patronage of Lord Panmure and the means of pursuing his art studies in London as a student at the Royal Academy. His subjects were at first all Scotch,— 'A Scotch Fair,' 'A Scotch Washing,' etc., or in individual portraits. A visit to Spain for his health's sake in 1851 resulted in a distinct change both of style and subject and thenceforth his standing among the foremost British artists was assured; he subsequently made two further visits to Spain and also spent three months at Rome. Among his works are 'The Letter-writer of Seville'; 'The Spanish Contrabandista'; 'The Early Career of Murillo'; 'La Bomba'; 'La Gloria'; 'Il Cigarillo'; 'The Marriage of the Princess Royal.'

PHILLIPIUM, *in chemistry*, a rare element belonging to the yttrium group. Discovered by Delafontain (1878) in a sample of the mineral samarskite obtained from North Carolina, it appears to form two series of compounds, the phillipous and the phillipic, but the chemistry of these substances and even the elementary nature of the so-called phillipium itself needs further confirmation.

PHILLIPPS, fĭl'ĭps, **Sir Thomas**, English book-collector: b. Manchester, England, 2 July 1792; d. Cheltenham, England, 6 Feb. 1872. He studied at Rugby and Oxford, early evinced a taste for collecting valuable books and manuscripts and devoted his entire life to his collections, which exceeded 60,000 books and manuscripts and a large number of old coins and pictures. In 1821 he was created a baronet, and in 1822 established a printing-press on his estate, from which he issued publications important to collectors. His eldest daughter was married to James Orchard Halliwell, the Shakespearian scholar, who upon succeeding to Sir Thomas' estates changed his name to Halliwell-Phillipps (q.v.). The vast collection was bequeathed to the youngest daughter, but much of it is now scattered.

PHILLIPS, ĭfl'ĭps, **Adelaide**, American singer: b. Stratford-on-Avon, England, 26 Oct. 1833; d. Carlsbad, 3 Oct. 1882. At seven she removed with her family to Boston, and at the Boston Museum, 25 Sept. 1843, made her début as Little Pickle in 'The Spoiled Child.' She afterward appeared as a juvenile danseuse at Barnum's Museum in New York, under the name of "the Child of Avon." At the Boston Museum she subsequently played soubrette parts, and in 1846 appeared at the Walnut Street Theatre, Philadelphia, as Rosa in 'John of Paris.' In 1852, having developed a contralto voice of rare qualities, on the advice and with the practical assistance of Jenny Lind, she went to Italy for study. After two years she returned to the United States, having meanwhile (1853) made a successful début in 'Semiramide' in Brescia. She appeared in concert in Boston (1854), and made her first American appearance in opera 17 March 1856, at the Academy of Music, New York, as Azucena in 'Il Trovatore.' She sang in the Italian Opera House, Paris, in 1861, and afterward in all the chief cities of the world. For many years she was the foremost of American contralto singers. Consult biography by Waterston (1883).

PHILLIPS, David Graham, American novelist: b. Madison, Ind., 1867; d. New York, 24 Jan. 1911. In 1887 he was graduated at Princeton University and at once entered the field of journalism. In New York he was first on the staff of the *Sun*; next he became London correspondent of the *World*, after which he was for a time private secretary to Joseph Pulitzer, owner of the *World*. In 1901 he published his first novel 'The Great God Success,' which at once brought him into general notice as a story-teller of marked ability. He dealt largely in his books with the burning problems of the day and was always interesting, informing and entertaining. His best works are 'The Second Generation' (1907); 'Old Wives for New' (1908); 'Hungry Heart' (1909); 'Her Serene Highness' (1902); 'Golden Fleece' (1903); 'The Social Secretary' (1905); 'The Fortune Hunter' (1906); 'Light-Fingered Gentry' (1907); 'Worth of a Woman' (1908); 'The Husband's Story' (1910); 'The Grain of Dust' (1911). Consult Cooper, F. T., 'Some American Story-Tellers' (New York 1911) and Underwood, J. C., 'Literature and Insurgency' (ib., 1914).

PHILLIPS, George Searle ("January Searle"), American author: b. Peterborough, England, January 1815; d. Morristown, N. J., 14 Jan. 1889. He was educated at Cambridge, came to New York, and engaged in journalism, but returned to England in 1845. He was editor of the Leeds *Times*, principal of the People's College, Huddersfield, England, in 1846, and later came back to the United States, where he settled permanently. He edited the Chicago *Republican*, in conjunction with Charles A. Dana (q.v.), and afterward was literary editor of the New York *Sun*. In 1873 he became insane, and the remainder of his life was spent in an asylum. He wrote 'Life of Ebenezer Elliott' (1850); 'Memoirs of Wordsworth'; 'Emerson: His Life and Writings'; 'The Gypsies of the Dane's Dyke', etc.

PHILLIPS, Henry, American archæologist: b. Philadelphia, 6 Sept. 1838; d. there, 6 June 1895. He studied law and was admitted to the bar in 1859, but practised little, devoting his attention chiefly to numismatics, archæology, etc. He published 'History of American Colonial Paper Currency' (1865); 'History of American Paper Money' (1866); 'Pleasures of Numismatic Science' (1867); 'Poems from the Spanish and German' (1878); a translation of Chamisso's 'Faust' (1881); and four volumes of translations from the Spanish, Hungarian and German (1884–87).

PHILLIPS, Henry Myer, American lawyer and politician: b. Philadelphia, 30 June 1811; d. 3 Aug. 1884. He was admitted to the bar in his native city in 1832, turning his attention with much success to criminal and civil practice. In 1856 he was elected as a Democrat from the fourth district of his State, to the 35th Congress. After the expiration of his term, he accepted many positions in educational, charitable and financial institutions, became a commissioner of the Board of City Trusts, having control of the Stephen Girard estate, and was made president of that board and president as well of the board of directors of the Academy of Music, Fairmount park commission, and director of numerous corporations. He served also as Grand Master of Freemasons of the State.

PHILLIPS, John, American educational benefactor: b. Andover, Mass., 6 Dec. 1719; d. Exeter, N. H., 21 April 1795. He was a son of Samuel Phillips (1690–1771), was graduated from Harvard in 1735, and after studying theology preached for a time. He was afterward a merchant at Exeter, and for several years one of the New Hampshire council. In 1778 he assisted in founding Phillips Academy at Andover, and in 1781 he founded Phillips Academy at Exeter. He was also a benefactor to Dartmouth College.

PHILLIPS, John, English geologist: b. Marden, Wiltshire, 25 Dec. 1800; d. Oxford, England, 24 April 1874. He was educated under the supervision of his uncle, William Smith, the geologist, with whom he engaged in geological investigations in England. In 1834 he accepted the chair of geology at King's College, London, receiving an appointment to the same position at the University of Dublin in 1844 and at Oxford in 1856. He was keeper of the Ashmolean Museum 1854–70, in 1859–60 president of the Geological Society and of the British Association in 1865. He wrote 'Guide to Geology' (1834); 'Memoirs of William Smith' (1844); 'Vesuvius' (1869); 'The Geology of Oxford and the Valley of the Thames' (1871), etc.

PHILLIPS, John Arthur, English geologist: b. Polgooth, Cornwall, 18 Feb. 1822; d. London, 4 Jan. 1887. He was graduated from the École des Mines, Paris, in 1846. In 1848–68 he was a mining engineer and metallurgist in London, acted as chemist to the Admiralty Commission, and in 1848–50 was professor of metallurgy at the college for civil engineers at Putney. He inspected the California gold mines in 1853 and later years, and wrote 'The Mining and Metallurgy of Gold and Silver' (1867); 'Elements of Metallurgy' (1874); 'A Treatise on Ore Deposits' (1884), etc.

PHILLIPS, Philip, American jurist: b. Charleston, S. C., 17 Dec. 1807; d. Washington, 14 Jan. 1884. He studied law in Charleston; was admitted to the bar at 21; and was a member of the State constitutional convention of 1832, known as the Nullification convention. Elected to the State legislature in 1834, he resigned in 1835 and removed to Mobile, Ala., where he practised his profession. He was president of the Alabama State convention in 1837; in 1844 was elected to the State legislature, and re-elected in 1852; was member of Congress from Alabama from 1853–55, and declining re-election he removed to Washington, D. C., and practised law until the Civil War, when he went to New Orleans, La. After the war he returned to Washington, where he resided until his death. In 1840 he prepared a 'Digest of Decisions of the Supreme Court of Alabama,' and was the author of 'Phillips' Practice of the Supreme Court of the United States.' As one of the eminent lawyers of his time, he was connected with some of the most noted law cases of the country.

PHILLIPS, Philip, American Methodist evangelist and singer: b. Chautauqua County, N. Y., 13 Aug. 1834; d. Delaware, Ohio, 25 June 1895. In 1861 he opened a music store in Cincinnati, and during the Civil War held song services in many northern cities to aid the Christian Commission, and in 1866 was musical editor of the Methodist Book Concern. In 1868 he visited England, where he sang 200 nights for the Sunday School Union, and prepared for them 'The American Sacred Songster,' of which 1,100,000 copies were sold. He traveled with D. L. Moody (q.v.), and in 1872 made a singing tour of the world. He published 'Spring Blossoms' (1865); 'Hallowed Songs' (1871); 'Our New Hymnal' (1894), etc.

PHILLIPS, Samuel, American colonial clergyman: b. Salem, Mass., 17 Feb. 1690; d. Andover, Mass., 5 June 1771. He was graduated at Harvard in 1708, studied theology and was ordained pastor of the Second or South Parish Church of Andover, in 1711, a pastorate which he held till his death. He was a notably strict Calvinist in his theology. His brother, John, was the great-grandfather of Wendell Phillips (q.v.), and his grandson, Samuel Phillips, was the founder of Phillips Academy at Andover.

PHILLIPS, Samuel, American lawyer and legislator: b. North Andover, Mass., 7 Feb. 1752; d. Andover, Mass., 10 Feb. 1802. He was a grandson of Samuel Phillips (1690–1771) (q.v.), and was the fifth of the name. He was graduated at Harvard in 1771. He succeeded his father as town clerk of Andover in 1773, was a member of the provincial congress 1775–80, and of the Massachusetts constitutional convention, 1779–80. He sat in the State senate 1780–1801 (excepting in 1787–88), was lieutenant-governor 1801–02, and justice of the court of Common Pleas for Essex County, 1781–98. He is best known as the founder of Phillips Academy, a project conceived by him soon after leaving college and to the furtherance of which he induced his uncle, John Phillips (q.v.), the founder of Phillips Academy at Exeter, to contribute. (See PHILLIPS (ANDOVER) ACADEMY). His daughter, Mary, was the mother of Bishop Phillips Brooks (q.v.). After his death his wife assisted in the founding of Andover Theological Seminary.

PHILLIPS, Stephen, English poet: b. Somertown, near Oxford, 28 July 1868; d. 9 Dec. 1915. He abandoned an Oxford career to go on the stage in Frank Benson's company, in which he played in his time many parts and gained the experience which later was so greatly to aid him in the dramaturgic construction of his works. His first serious effort, 'Eremus' (1894), though praised by Stopford Brooke and Addington Symonds, attracted little general notice. It was later withdrawn by the author. 'Christ in Hades and Other Poems' (1896) found generous eulogists, but it was not until his 'Poems' (1897), a small collection, was crowned by the 'Academy' as the best work of the year with the first prize of 100 guineas, that Phillips achieved a reputation. In his later works he successfully revived the English poetic drama. Some discerning critics have regarded certain of the 'Poems' as his finest work, but the dearth of poetry in the English drama gave to 'Paolo and Francesca'

(1899); 'Herod' (1900), and 'Ulysses' (1902), and 'The Last Heir' (1908), a greater interest. Ulysses was presented in the United States in 1903. His other works include 'New Poems' (1903); 'The Sin of David' (1904); 'Nero' (1906); 'Pietro of Siena' (1910); 'The New Inferno' (1910); 'The King' (1912); 'Lyrics and Dramas' (1913); 'Iole' (1913); 'Armageddon' (1915); 'Panama' (1915). See Herod; Paolo and Francesca.

PHILLIPS, Thomas, English painter: b. Dudley, Worcestershire, 18 Oct. 1770; d. London, 20 April 1845. He was an early pupil of Edington, the glass-painter at Birmingham, and worked as his assistant until 1790, when he went to London and was employed by West in executing a design for the windows in Saint George's Chapel, Windsor. Soon afterward he began to devote his time to portraits and became one of the most fashionable portrait painters of his day, in spite of the competition of Sir Thomas Lawrence, as well as of Hoffner, Shee, Owen and Beechey. His 'Venus and Adonis' (1808) secured his election as a Royal Academician, and in 1825 he was appointed Fuseli's successor as professor of painting at the Royal Academy. His lectures were published in 1833. He was very successful in catching a likeness, and his portrait of Napoleon, painted by stealth with the connivance of the Empress Josephine, is now at Petworth, and has been frequently engraved; that of David Wilkie by him is in the National Gallery. He also painted well-known likenesses of Lord Byron and Sir Walter Scott, as well as of Crabbe, Chantrey, Southey, Coleridge, Campbell, Rogers and Sir Humphrey Davy.

PHILLIPS, Thomas W., American capitalist and legislator: b. Mount Jackson, Pa., 1835; d. 1912. He acquired vast interests in oil wells and was one of the largest individual oil producers of the country. He was also interested in politics and during the Garfield campaign of 1880 originated the campaign textbook. From 1893 to 1897 he was a member of Congress, where he introduced the bill creating the Industrial Commission. He served on the newly-formed Commission and in 1902 submitted a supplementary report which resulted in the creation of the Bureau of Corporations.

PHILLIPS, Ulrich Bonnell, educator and economist: b. La Grange, Ga., 4 Nov. 1877. He graduated at the University of Georgia, A.B., 1897; A.M., 1899; and there was Fellow and tutor in history 1897–1900. In 1901 he was awarded the Justin Winsor prize of the American Historical Association. From 1900–02 he was Fellow of Columbia University, where he received his Ph.D. degree in 1902. He was instructor in history 1902–07 and assistant professor 1907–08 at the University of Wisconsin; professor of history and political science, Tulane University 1908–11; and from 1911 professor of American history at the University of Michigan. He also acted as research assistant at the Carnegie Institution of Washington, 1904–06; was collaborator of the American Bureau of Industrial Research 1905–09; was army camp educational director, Y.M.C.A., Camp Gordon, 1917; and is associate of many learned societies. He came into international prominence as the author of numerous articles on the economics of slavery, on the plantation system and ante-bellum politics. He edited 'Plantation and Frontier Documents' (1909); 'The Correspondence of Robert Toombs, Alexander H. Stephens and Howell Cobb' (1913); and is author of 'Georgia and State Rights' (1902); 'History of Transportation in the Eastern Cotton Belt' (1908); Life of Robert Toombs' (1913); 'History of American Negro Slavery' (1918).

PHILLIPS, Wendell, American orator and reformer: b. Boston, 29 Nov. 1811; d. there, 2 Feb. 1884. He was graduated from Harvard in 1831, a classmate of J. L. Motley (q.v.). After three years' study at the Harvard Law School he was admitted to the bar in 1834; but he took slight interest in the legal profession. On 21 Oct. 1835 he saw Garrison (q.v.) dragged through the streets of Boston by those «gentlemen of property and standing,» as the press styled them, who had been disappointed in their original purpose of bringing George Thompson (q.v.) to the tar-kettle. From that time he was an Abolitionist, with which interest he identified himself in 1836. He came at once into prominence by his great Faneuil Hall speech of 8 Dec. 1837. Through the efforts of W. E. Channing a meeting had there been assembled suitably to protest against the murder of E. P. Lovejoy (q.v.) at Alton, Ill., while defending the freedom of the press against a pro-slavery mob. But the entire purpose of the gathering seemed likely to be defeated by James T. Austin, a parishioner of Channing and attorney-general of Massachusetts, who, in a singularly absurd outburst likened the Alton rabble to the patriots of the Revolution and declared that Lovejoy had perished «as the fool dieth.» It appeared not improbable that these most ill-considered remarks might divide the audience, when Phillips, by invitation, took the platform and made answer. «When,» he said, as he began that stinging rebuke, «I heard the gentleman lay down principles which placed the rioters, incendiaries and murderers of Alton side by side with Otis and Hancock, with Quincy and Adams, I thought those pictured lips (here indicating the portraits in the hall) would have broken into voice to rebuke the recreant American, the slanderer of the dead.» Phillips became forthwith the chief of American orators and the apostle of the Garrisonian school of abolition. He accepted the creed of Garrison almost without condition, though he became but gradually a disunionist and was never a non-resistant. In 1839 he withdrew from professional practice, being unwilling to bind himself by the advocate's oath of fealty to the Constitution. Later, for a similar reason, he declined Congressional candidacy. With Garrison he opposed in 1839–40 the attempt to debar any from the anti-slavery platform on the ground of differences in religious faith, and the organization of the Abolitionists into a political party. He disagreed, however, with Garrison in 1864 in regard to Lincoln's re-election, which he did not favor; and in 1865, respecting the discontinuance of the Anti-Slavery Society, which Garrison held then to have concluded its mission. Phillips believed that the education and enfranchisement of the negro ought to be accomplished, and was elected in Garrison's place to the presidency of the society, a post which he held until the disbandment, 9 April 1870, con-

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sequent upon the passage of the 15th amendment. But his activities did not now pause here. He thought the task of reform was never done, and on this idea placed a most valuable emphasis. So he spoke for the Indian, for the Irish, for improvements in the criminal law and prison administration, for women suffrage, for legislative control of the sale of liquor and against accumulations of corporate wealth dangerous to the State. In all these causes Phillips was never even remotely the demagogue, though at times his associates may have been such. He received in 1870 about 20,000 votes as labor-reform and temperance candidate for the governorship of Massachusetts. He was known also for years as one of the kings of the American lyceum, among his most famous addresses being 'The Lost Arts,' 'Toussaint l'Ouverture' and 'Daniel O'Connell.' Among his occasional orations may be mentioned that in memory of Theodore Parker (q.v.) and that on 'The Scholar in a Republic,' given in 1881 at the centennial of the Harvard Phi Beta Kappa. A scholar himself, in the narrower acceptance, Phillips was not. The course of his activities did not allow this; but he was a considerable reader, appropriated to his own uses all that he studied and found ample supply of needful illustration in the history of the English Revolution of 1630, on which subject he had once read every work obtainable. Contemporary evidence as to his oratory is unanimous and places him with Webster and Everett. His method was far different from theirs; he replaced their rounded sonority by the easy, limpid and colloquial style which since his time has remained the type of the best American public speech. He spoke with much repose, did not lack for appropriate wit and was superb in sarcasm, epigram or invective. He surrendered worldly preferment to identify himself with a despised propaganda; he gained his fame and saw his victory against heavy odds, opposed to the inertia of a general prejudice. Many of his speeches were, as reports show, sword-play with a hostile audience. Of course, under existing conditions, he made mistakes, but his fine attainments were always finely used. He contributed to *Anti-Slavery Standard* and *The Liberator,* and wrote several pamphlets. A collection of his 'Speeches, Lectures and Letters,' edited by J. Ridpath, was published in 1864; a second series, by T. C. Pease in 1892. Consult Austin, G. L., 'Life and Times of Wendell Phillips' (new ed., Boston 1893); Martin, W. C., «Wendell Phillips The Agitator» in 'American Reformers' (New York 1890); Russell, C. E., 'The Story of Wendell Phillips, Soldier of the Common Good' (Chicago 1914); Sears, Lorenzo, 'Wendell Phillips, Orator and Agitator' (New York 1909); also works treating of the anti-slavery period and its leaders.

PHILLIPS, William, American merchant, son of Samuel Phillips (1690–1771): b. 1722; d. 1804. He was a wealthy merchant of Boston, and becoming interested in the project of an academy at Andover as outlined by his nephew, Samuel Phillips (1751–1802), gave to it an amount equal to that contributed by his brother Samuel. He was a member of the Massachusetts legislature and held various political offices of importance.

PHILLIPS, William, American educational benefactor, son of William Phillips (1722–1804): b. Boston, Mass., 10 April 1750; d. there, 26 May 1827. He engaged in business with his father, became wealthy and was 12 times chosen lieutenant-governor of Massachusetts (1812–23). At his death he bequeathed large sums to Phillips (Andover) Academy and to Andover Theological Seminary.

PHILLIPS, William Addison, American soldier: b. Paisley, Renfrewshire, Scotland, 14 Jan. 1824; d. Fort Gibson, Okla., 30 Nov. 1893. He received an academic education prior to the migration of his father's family to America in 1838. He grew to manhood on a farm in Illinois. At the age of 22 he engaged in newspaper work and later began the study of law. In 1855 he went to Kansas as a special correspondent of the New York *Tribune.* Although he was offered a large salary to go to the front as a correspondent at the outbreak of the Civil War, he chose rather to enter the volunteer military service. He was commissioned major of the 1st Indian Home Guard regiment in 1862 and was soon promoted to the colonelcy of the 3d Indian Home Guard regiment. He commanded the Indian brigade, with headquarters at Fort Gibson, and for a time commanded a division, though never promoted above the rank of colonel. His position as the ranking Federal military commander in the Indian Territory during most of the time for two years was one which called for the exercise of energy, tact, diplomacy and administrative ability of a high order as well as a large degree of military skill. From 1873 to 1879 he represented the first Kansas district in Congress. Almost radically progressive in his views, he was a careful student of economics and sociology, as evidenced by his work, 'Labor, Land and Law,' which was published in 1886. After his retirement from Congress he served for some years as an attorney for the Cherokee Nation. He was buried at Salina, Kan., of which town he was one of the founders.

PHILLIPS (ANDOVER) ACADEMY, a celebrated college preparatory school for boys at Andover, Mass., founded 25 April 1778, opened 30 April 1778 and incorporated 4 Oct. 1780. It owes its existence to the initiative of Samuel Phillips (1751–1802). The property, originally conveyed to the academy trustees by Samuel Phillips (the elder) and his brother John, consisted of 141 acres with several buildings upon it, in Andover, 200 acres in Jaffrey, N. H., and some $8,000 in cash. In 1785 a new academy building was erected, the gift of the three brothers, Samuel, John and William Phillips. The trustees of the academy were vested in 1807 with authority to receive and hold funds for a theological school and what is now known as the Andover Theological Seminary (q.v.) was founded the next year. The academy has grown to be one of the foremost institutions of its kind in this country, and in recent years its equipment has been very materially increased, the archæological department with ample endowment and costly building being one of the most notable of recent gifts. The larger number of the students go to Harvard and Yale on leaving the academy, and the institution is, therefore, based on the requirements of those universities. It accommodates about 400 pupils. Its endowment now amounts to about $500,000, and outside of invested funds the academy property amounts in value to $500,000. There are 60,000 volumes in the several libraries of the institution. Consult Adams, 'Some Famous American Schools' (1903).

PHILLIPS (EXETER) ACADEMY, a noted American college preparatory school at Exeter, N. H., incorporated 3 April 1781, endowed by John Phillips, 9 Jan. 1782, opened 7 May 1783. The institution was the earliest of an educational character incorporated by the New Hampshire legislature, and was named in honor of its founder, John Phillips (q.v.), whose gifts to it totaled $65,000. It accommodates 300 and odd students. Like the sister institution at Andover, it has prospered greatly in recent years, and many new and commodious buildings have been erected within the past decade, the most notable of these being the great dining hall, built in 1903. It has an endowment of $400,000 and an annual income of $100,000. Its alumni number about 10,000. A marked characteristic of the school is its thorough carrying out of the principle of self-government. Consult Adams, 'Some Famous American Schools' (1903).

PHILLIPSBURG, fĭl'ĭps-bėrg, N. J., town in Warren County, on the Delaware River, and on the Central of New Jersey, the Pennsylvania, the Delaware, Lackawanna and Western, Lehigh and Hudson and the Lehigh Valley railroads, about 60 miles in direct line west of Newark. It was settled in 1749, and in 1861 was incorporated. It has good water power and excellent facilities for transportation. The chief manufacturing establishments are foundries and furnaces, railroad shops for the five railroads, horseshoe works, boiler and drill works, machine shops, stove works, sheet iron works, silk mills and large coal yards. Its prominent public buildings are its municipal buildings, several business edifices, the churches and schools. It has several private business schools, public and parish schools and a public library. The government is administered under a revised charter of 1875 and is vested in a commission of five, which holds office for a term of four years. Pop. 15,652.

PHILLPOTTS, fĭl'pŏts, **Eden,** English novelist: b. Mount Aboo, India, 4 Nov. 1862. After serving as clerk in a fire insurance office at Plymouth in 1880–90, he studied in London for the stage, but found "his ability did not justify perseverance." His earlier works are of inferior value. Among his representative books are 'Down Dartmoor Way' (1895); 'Lying Prophets' (1897); 'Children of the Mist' (1898); 'Sons of the Morning' (1900); 'The Good Red Earth' (1901); 'The Striking Hours' (1901); 'The River' (1902); 'My Devon Year' (1903); 'The Secret Woman' (dramatized in 1912); 'Knock at a Venture' (1905); 'The Portreeve' (1906); 'The Virgin in Judgment' (1908); 'The Three Brothers' (1909); 'Dance of the Months' (1911); 'The Forest on the Hill' (1912); 'The Iscariot' (poem 1912); 'Widcombe Fair' (1913); 'Curtain Raisers' (1914); 'Old Delabole' (1915); 'The Human Boy and the War' (1916); 'The Chronicles of Saint Tyd' (1917); and 'Storm in a Teacup' (1919). Phillpotts is the recognized interpreter of Dartmoor folk and scenery, and received high praise from R. D. Blackmore (q.v.).

PHILO BYBLIUS, fī'lō bĭb'lĭ-ŭs, **Herennius,** Phœnician grammarian: b. Byblos, Phœnicia; flourished between 64 and 141 A.D. He is the author of a famous historical work, 'Concerning Cities and Their Renowned Citizens.' It is in 30 books and has proved the thesaurus of later grammarians. He also executed a translation of the alleged work of Sanchuniathon (q.v.), of which some fragments have survived and have been published in the third volume of Müller's 'Fragmenta Historicorum Græcorum,' Vol. III. The alleged complete text of Sanchoniathon, which was discovered in a Portuguese monastery and published by Wagenfeld (1837), proved to be a forgery.

PHILO JUDÆUS, joo-dē'ŭs, Jewish philosopher: b. about 20 B.C.; d. not later than 54 A.D. He went to Rome in 42 A.D. as one of a deputation from Alexandria to the Emperor Caligula, to persuade him to release the Jews from the obligation of adoring the imperial statue. He was the oldest of five deputies. This and the fact that he visited Jerusalem and belonged to a wealthy family is nearly all that is known of his life.

Before the time of Philo the Hellenized Jews (see HELLENISTS), particularly those of Alexandria, had begun to blend the ideas of the Greek philosophers with the teaching of their own sacred books; but as they generally held that the Pentateuch itself was the source of inspiration from which the Greeks derived what was true in their philosophy, they endeavored by allegorical interpretations of their own books to find "indications of the profoundest doctrines of philosophy in the simplest stories of the Pentateuch." It was in this school that Philo was brought up. His philosophy was thus strictly a theosophy. It rested, as its direct foundation, on the Jewish Scriptures as an inspired revelation, and with these it incorporated the speculations of the writer, founded on the systems of Greek philosophy, which best harmonized with the teaching of the Hebrew Scriptures, and especially on the philosophy of Plato.

Philo's idea of God was partly religious, partly philosophical. From his faith as a Jew he derived the principle that God is to be worshipped as a personal being, but in developing his conception of God he is indebted chiefly to philosophical speculations. He held that God is incorporeal and only cognizable by reason. He is the most universal of beings, and higher than knowledge, goodness or beauty, *per se.* He has, strictly speaking, no attributes, being pure, unqualified being; he is therefore incomprehensible. The attributes ascribed to God in Scripture are to be understood only figuratively. God is present everywhere in the material universe by his operations; nowhere in his essence. God is the only free being. All others are subject to necessity. Philo's notions of matter are not remarkably consistent. He held God to be too perfect to have any association with it, yet he holds Him to be the Creator of the universe. Between God and the world there is an intermediate being, the Logos. He wavers in his account of the Logos also. The Logos is the most universal of all beings except God. The Logos contains in itself the sum of ideas — powers or spiritual forms which pervade the universe, and which are creative, governing, foreseeing, law-giving, etc. These forms are also regarded as either qualities of the deity or distinct persons. Sophia, wisdom, is sometimes considered as the first of the potencies of the Logos, sometimes as the mother of the Logos. God created the world as already indicated, by the agencies of these potencies, or of the Logos in whom they reside, out of unqualified matter. He gives the Logos the titles of Son of God, Paraclete, and Mediator between God and Man.

Man is a dual being, having a soul that came from God, tied to a body that naturally tends to the things of sense; by the aid of God the soul may be lifted above the body and ultimately regain its original source.

In interpreting Scripture Philo recognizes a double sense, the allegorical, which is the more important, and the literal, which is not to be neglected. The anthropomorphic representations of God in Scripture he regarded as an accommodation to the sensual nature of man. It is a fundamental principle with him that the law, which emanates from the being who is both the creator and the father of the universe, is in harmony with nature, and that he who violates it is punished by natural events. Consult Drummond, 'Philo Judæus' (1888); Conybeare, 'Philo about the Contemplative Life' (1895); Freudenthal, 'Die Erkenntnislehre Philons von Alexandria' (1891), and the 'Jewish Encyclopedia.'

PHILOBIBLON, fī-lō-bĭb'lŏn, a prose eulogy of books and learning written in Latin by Richard Aungerville, called Richard de Bury from his birthplace (1287). He was bishop of Durham and lord high chancellor and treasurer under Edward III. The work was finished in 1300, and first printed at Cologne in 1472. 'Philobiblon' was intended to serve as a handbook to the library which he founded in connection with Durham College at Oxford (afterward suppressed). It gives an interesting account of how he collected his library, describes the state of learning in England and France and closes with an explanation of the rules for the management of his library, which were founded on those adopted for the library of the Sorbonne. An American edition was printed at Albany, N. Y. (1861), by Samuel Hand, and the Latin text, with translation by Andrew F. West, was issued by the Grolier Club of New York (1889). See Aungerville, Richard.

PHILOCHORUS, fĭl-ŏk'ō-rŭs, Greek historian: flourished in Athens between 306 B.C. and 260 B.C. Suidas states him to have been a contemporary of Eratosthenes, an adherent of Ptolemy Philadelphus, and a bitter opponent of Demetrius Poliorcetes and his son, the latter of whom had him put to death when he took possession of Athens. His best-known work, 'Atthis,' a history of Athens dating from the remotest period of their history down to the death of the author, is the most valuable and authentic of the special histories of Attica. Fragments of it are preserved in Müller's 'Fragmenta Historicorum Græcorum' (1841).

PHILOCTETES, fĭl-ŏk-tē'tēz, Greek archer. He was a friend and armor bearer of Heracles, who bequeathed to him his bow and arrows. As one of the suitors of Helen he started with seven ships for the Trojan War, but becoming ill from the bite of a serpent was left by the Greeks on the island of Lemnos. An oracle declared that Troy could not be taken without the arrows of Heracles, and Ulysses and Diomedes journeyed to Lemnos, whence Philoctetes accompanied them to Troy and fought bravely until the city was taken, slaying Paris with one of his poisoned arrows. The legend was dramatized by Sophocles, Æschylus and Euripides, the play by Sophocles still surviving.

PHILODEMUS, fĭl-ō-dē'mŭs, Greek Epicurean philosopher and epigrammatic poet, a contemporary of Cicero. He was a resident of Gadara in Palestine, and a leading Epicurean of his time. The 'Greek Anthology' contains 34 of his epigrams.

PHILOLAUS, fĭl-ō-lā'ŭs, Pythagorean philosopher; according to Plato he was a contemporary of Socrates, and was born in Magna Græcia. He left Metapontum on account of political disturbances and entered Lucania. Later on he visited Thebes. The teachings of Pythagoras were for the first time committed to writing by him. The only fragments of this work which are extant Böckh declares to be genuine (1819). Their genuineness has, however, been denied by Schaarschmidt, 'Die angebliche Schriftstellerei des Philolaus' (1864). Some of them are undoubtedly authentic, others spurious.

PHILOLOGICAL ASSOCIATION, American. See American Philological Association.

PHILOLOGICAL SOCIETY, British, a society founded in London, 1842, for the study of language according to its scientific analysis. It publishes annually its 'Transactions,' a volume of papers read at its meetings, which are held monthly from November to June. The most important work of the British Philological Society has been the publication of the 'New English Dictionary,' which was begun under the editorship of James (later Sir James) A. H. Murray in 1857, and has not yet been completed.

PHILOLOGY. See Language, Science of.

PHILOMEL, a poetic name for the nightingale (q.v.), especially the large Asiatic species (*Daulias philomela*) or the Persian form (*D. hafizi*).

PHILOMELA, fĭl-ō-mē'lạ, in Greek mythology, daughter of Pandion, king of Athens; was by fraud won by Tereus, a Thracian king, to be his bride, Tereus pretending that his wife, Procne, her sister, was dead. Lest Philomela should reveal her wrongs, Tereus cut out her tongue. But she contrived to acquaint Procne with her story. The sisters in revenge slew Itys, son of Tereus, and served him to his father at table. The gods transformed Philomela into a nightingale and Tereus and Procne, Itys and Pandion into other birds.

PHILOMELA, The Lady Fitzwater's Nightingale, title of a romance by Robert

Greene, published 1592, probably founded on the story of Tito and Gisippo in the Decameron, or the ‘novela del curioso impertinente’ related in Don Quixote, Book 1, chap. 34 et seq.

PHILOPŒMEN, fil-ō-pē'mĕn, Greek general and statesman: b. Megalopolis, Greece, 252 B.C.; d. Messene, Greece, 183 B.C. He came of a noble Arcadian family, was orphaned at an early age and brought up by Cleander, an influential citizen of Mantinea, received his education under the philosophers Ecdemus and Demophanes, and gained his first military experience in the border raids between the Arcadians and Laconians. In 222 he aided in the defense of Megalopolis against Cleomenes, king of Sparta, and in 221, at the head of a company of horsemen, fought under the Macedonian king, Antigonus, who came to the aid of the Achæans against the Spartans. In 210 he was appointed general of the Achæan horse, and in 209 accompanied Philip in his expedition against Elis, conducted himself with his usual bravery and slew in battle the Elean commander Demophantus. In 208 he was elected strategus or commander-in-chief of the Achæan League, an office to which he was seven times re-elected. He introduced reforms in military arms and discipline, and brought the army to the highest state of efficiency it had attained since the decline of Greece. In 208 he utterly routed the Spartans under Machanidas at Mantinea and was proclaimed the «liberator of Greece» at the Nemean festival. In 194 he was reappointed strategus, defeated Nabis in 192, forced Sparta to enter the Achæan League and upon her revolt in 188 defeated her forces and compelled her to adopt Achæan laws. In 183, when Philopœmen lay ill at Argos, the Messenians revolted and he arose from his sick-bed to lead the army against them, though now a man of 70. He was captured and given a cup of poison by Deinocrates, the Messenian leader. He is the last of the great Greek commanders. Consult Plutarch, ‘Life of Philopœmen’; Mahaffy, ‘Alexander's Empire’ (1888).

PHILOSOPHER OF FERNEY, The, a title by which Voltaire was known on account of his residence from 1758 to 1788 at Ferney, five miles northwest of Geneva.

PHILOSOPHER OF MALMESBURY, The, a title given to Thomas Hobbes (q.v.), who was born at Malmesbury in Wiltshire.

PHILOSOPHER OF SANS SOUCI, The, a name which Frederick the Great applied to himself on account of his residence at the palace of Sans Souci which he built at Potsdam.

PHILOSOPHER OF WIMBLEDON, The, a name bestowed upon John Horne Tooke (q.v.), the political writer and grammarian, whose later years were passed at Wimbledon, Surrey.

PHILOSOPHER'S STONE. See ALCHEMY.

PHILOSOPHICAL SOCIETY, American. See AMERICAN PHILOSOPHICAL SOCIETY.

PHILOSOPHY. Definition of Philosophy.— No satisfactory answer to the question, What is philosophy? can be derived either from the meaning of the word, or from the consensus of opinion expressed by writers on philosophy, unless these opinions are themselves subjected to comparison and criticism from the philosophic point of view. For the conception which defines the task, and describes the method of philosophy is itself subject to change and growth; and accurate and harmonious definitions are themselves among the latest products of any pursuit conducted by a truly scientific method. But this, like every other development, has certain permanent features; it follows, more or less closely, certain clearly discernible lines of movement. To describe these features and follow these lines must, therefore, determine the method of our attempt to answer the question: What is philosophy?

In its most general meaning, though in rather vague and aimless fashion, *philosophising* dates back to the very beginnings of human mental development. The savage or primitive man (the *Naturmensch*), instead of being, as is sometimes supposed, untroubled by metaphysics, is much more, if this were possible, naïvely and necessarily metaphysical than is his civilized descendant. But the results of his reflective thinking over the problems of existence, of the origins of things and of human life and destiny, take the forms of myth and legend rather than of scientific system.

The particular line of development which chiefly concerns us in the attempt to define philosophy is traced back to the Greeks. This statement is true for two reasons: (1) The Greeks first separated philosophical speculation from its dependent connection with religious myth and theological conceptions; and (2) they are, in fact, the ancestors of that branch of the universal family of philosophers to which we belong.

History of Opinion.— Originally, a loose and wide meaning was given to the term «philosopher» (φιηόσυφος). At first, it stood for any man who, whether by travel or reading or interest in art, had the spirit and acquisitions of intellectual culture. Solon was said to have «traveled through many lands philosophizing» (Herodotus i, 30); and Thucydides, in his funeral oration over Pericles, claims for all the Greeks that they love the beautiful with true simplicity, and «philosophize without effeminacy.» The earliest more systematic attempts at philosophy among the Greeks displaced the theogonies of the poets, or their explanations of the universe as due to the actions of the gods, with cosmogonies, or speculations as to the origin of things and the causes of experience, by means of known physical elements or mental principles. As yet, however, there was no distinction between philosophy and the positive sciences; and, indeed, *science* did not exist in the modern acceptance of the term.

It is customary to say that Socrates was the first «to lead mankind from the study of the universe to the study of man»; but this is only relatively true. With Plato and Aristotle the more definite conception of the sphere of philosophy, and the use of the more scientific method for its pursuit, began — not only among the Greeks but among all mankind. In spite of those many and important differences, which the latter seems to have taken pains to exaggerate, these two great thinkers are in substantial agreement as to the essential nature of philosophy. With them both, the word does not stand for any one particular science or even for the aggregate of all the sciences; on the contrary, philosophy is held by Plato and Aristotle to be the supreme and only true science, or knowledge of the universal and unchanging.

Plato taught that philosophy imparts to the mind something more than merely «correct opinion»; that it deals with being, and not with seeming; with the truly real; it, therefore, implies the acquisition of what is knowable, in the highest meaning of the word. But the essential and immutable being of everything is its idea; and of all the ideas, the supreme one is the idea of the good. Philosophy is, therefore, the knowledge of the ideal and absolute elements of things. Aristotle, on the other hand, regarded philosophy as science, or knowledge, in general; in his scheme it comprised the speculative, the practical and the artistic sciences. But there was also a «first philosophy,» or supreme science; and in his conception of this, Aristotle agrees in the main with Plato. For «first philosophy» investigates being as being; it inquires into the first principles and ultimate causes of things; and thus it renders possible the knowledge of that absolute principle which presupposes nothing more ultimate than itself. The peculiar characteristics of philosophy are thus held to be its certainty, universality, independence, supremacy and a kind of divine character. This last characteristic makes it worthy of honor even by Deity itself.

Although the later Greek philosophy, under the conduct of the Stoics and the Epicureans, took a more practical turn, and although philosophy during the Middle Ages, being employed by Christian theologians in the defense of dogma, lost much of its characteristics of independence and supremacy, the conceptions of the greater Greek thinkers remained substantially unchanged down to modern times. When the Renaissance gave back to philosophy its independence, both Bacon and Descartes regarded philosophy as a universal science. The former held that all human cognitive endeavors are summed up in history, poetry and philosophy, which correspond to the three faculties of memory, imagination and reason. Thus everything which is an object of knowledge by human reason falls within the sphere of philosophy. Bacon, too, like Aristotle gave a special place to first philosophy. Descartes regarded philosophy as a universal science; but first philosophy is the science of principles,— that is, of the highest generalizations of all the positive sciences. Descartes did in a way for modern philosophy what Socrates is said to have done for Greek philosophy; he made its point of starting a critical examination of the mind of man.

With Locke and his successors, but especially with the critical philosophy of the «astounding Kant» (first edition of his 'Critique of Pure Reason,' 1781), philosophy became chiefly an analysis and criticism of the cognitive powers of the human mind. Thus one branch of the subject — namely, the philosophy of knowledge, or epistemology — occupies the chief place in, if it does not usurp the whole of, the field properly covered by the term. Such is in a peculiar way the position of Kant, who holds that the primary and chief task of philosophy is to ascertain the a priori elements and principles of the human mind, and to arrange these together into a system. As to a science of reality — meaning by this, the knowledge of the world of beings that exist independently of human mental representations — this great thinker comes to a sceptical conclusion. But with the successors of Kant philosophy began again to be considered more as of old — an absolute, universal and independent science, whose authority within its own proper domain must be considered as supreme. In one way or another, this was the position of Fichte, Schelling and Hegel.

While the Scottish school, consisting of Reid and his followers, reduced philosophy to a kind of theoretical psychology, and Positivism denied the possibility of philosophy with anything like its traditional meaning and claims; still the conception of its aim and its scope, which is honored by time and is essentially the same as the ancient notion, continues to maintain itself. Yet there are to be noted significant changes in the points of view, in the use of method, in the factors chiefly emphasized; and, especially, in the notion of the relation which philosophy properly sustains to the particular sciences. These changes must, then, be briefly noticed, if one would arrive at a satisfactory answer to the question: What is philosophy?

Analysis of the Factors.—The modern conception of philosophy can now, in its more complete and scientific form, be best understood by stating what are the principal problems, or groups of problems, which it attempts to solve. These may be conveniently arranged under the following four heads: (1) Especially since the time of Kant, the question of the nature, limits and validity of human reason itself has occupied a prominent place in the discussions of philosophy. With Kant himself — as we have already seen — this self-criticism of reason was the principal part of philosophical discipline. To quote the words of Fichte: «This science can be nothing but the universal knowledge, which has come to know of itself, and has entered a state of light, consciousness and independence, in regard to itself.» Or, according to the more extreme statement of another advocate of a similar view: «Philosophy calls itself knowledge of the Universe (Weltweisheit)»; but «we call it self-knowledge.»

From this point of view, the outcome of philosophical discipline may be either one of two conclusions. The criticism of reason may end is what is known as positivism, or some form of phenomenalism. In this case reason, by self-criticism, would have discovered and proved that reason itself is limited to appearances of phenomena; that human knowledge cannot reach the world of reality. In a word, philosophy as a reasoned and systematic ontology, or a valid doctrine of real being, is found to be impossible.

But the opposite conclusion — namely, that all human knowledge somehow envisages, or implicates, reality — necessarily leads the thinker who holds it to lay emphasis on another main branch of philosophical discipline.

(2) The second form of the modern conception of philosophy continues to emphasize the factors rendered prominent by Plato and Aristotle, and which, indeed, have been prominent in the entire history of reflective thinking. As Matthew Arnold tersely puts the question:

«We want to know what Being is.» And in its revolt from the self-criticism which ends in scepticism, the mind of man continues to inquire after the nature of ultimate reality; it continues to believe that the forms of man's own mental life of cognition do somehow faithfully and truly represent the beings and events of a world which lies outside of that mental life, and which has, so to say, an existence and a value of its own. Philosophy is then conceived of mainly as a growth of assured knowledge of reality, and as a speculative activity of the human reason toward the transcendent ground of all existence. This view of the task of philosophy is that of Hegel and of all his followers, however dissenting from the details of the Hegelian system. It is also the view of those who, like Schopenhauer and Hartmann, cultivate systematic philosophy as a so-called metaphysics of the unconscious. It is even substantially the view of Herbert Spencer who, in spite of his doctrine of the Unknowable, has built up upon the basis of facts supposed to accord with his peculiar view of evolution, one of the most complete and stupendous theories of reality which the history of speculative thinking has ever produced. In a word, according to this view, «philosophy is the rational science of reality.» Or, as another modern writer declares: It is «the science of the most supreme and important realities.»

(3) It has always been felt that the more speculative conception of philosophy leaves the problems of human life too much out of its account. In order to merit appreciation for its real value, reflective and speculative thinking ought to result in practical truths or conclusions which may serve to enrich and guide the moral and social interests of mankind. This conception of the philosopher's task has always been prominent in the Orient. And in Oriental countries to-day the true philosopher is he who has wisdom; and so can counsel men as to what they ought to do, and as to what, in the world of reality itself, ought to be. In modern times Kant himself wrote (preface to Jachmann's 'Examination of the Kantian Philosophy of Religion') that, while philosophy, as a scientific theory, has only a relative value, «philosophy, in the literal meaning of the word, as a doctrine of wisdom, has an absolute value; for it is the doctrine of the final purpose of human reason.» From this point of view philosophy is chiefly a reasoned theory of values; and the principal task of the philosopher is to deal with the value-judgments of mankind, with the ideas and ideals of humanity as to what ought to be, —in conduct, in art, in society and in religion. In his effort to do this, the thinker must, of course, justify reason in respect of her ideals, and not simply discover and describe what those ideals happen to be at any particular point of time, or at any particular place, in man's historical development. It appears, therefore, that philosophic wisdom in this meaning of the term implies knowledge of the reasonable and of the universal.

(4) The great advances of the particular sciences in modern times have forced into a conspicuous position another and somewhat different conception of philosophy. This conception is by no means wholly new. For it has never been supposed that speculative thinking, whether in the form of a self-criticism of reason, or of a reasoned theory of reality, or of a rational system of practical principles, could dispense with all knowledge of facts, their uniform sequences and the laws of the forces operative in their realization. But the modern scientific development has certainly made imperative a new adjustment of the relations between philosophy and the particular sciences. Each one of these sciences is fast discovering its relations of reciprocal dependence and mutual good-will toward all of the other sciences. Each one when pressed to give an account of itself is discovered to have its own body of uncriticised presuppositions, its own naïve theory of knowledge and theory of reality, so to say. And, indeed, it is not difficult to show that even the most purely physical and positive of the sciences have to include certain value-judgments and conceptions of what ought to be in their methods of research and in their discovered principles. And thus the conception of philosophy as a «science of sciences» is, as it were, born anew, but with increased duties and increased liabilities to make mistakes, although also, with increased promises of success and reward. It is from this point of view that Professor Wundt has described philosophy as «the universal science which has to unite the cognitions, obtained by the particular sciences, into a consistent system.»

Synthesis of the Factors.— Both a study of the history of philosophy and a reflective consideration of these four groups of problems lead to the same conclusion. No one of the four can be left out of the proper conception of the field of philosophy. In particular, the theory of knowledge and the theory of reality, the self-criticism of reason and the unceasing and undaunted endeavors of reason to reach a worthy knowledge of the world of reality, are like the two sides of the one shield; or rather, they are twin ways of the functioning of man's rational powers, neither of which can exist without the other and both of which are destined to live because belonging to the very life and growth of reason itself. Moreover, what man knows, or thinks he knows, about his own rational life and about the ultimate reality, can never fail to be regarded by him as a basis for conduct, for art and for religion. Man cannot manage his life wisely, without regard to his views upon so-called epistemological and ontological problems. His doing cannot be wholly divorced from his thinking. For as one of the great modern philosophers (Fichte) has said: «A philosophical system is not a dead bit of furniture which one can take to one's self or dispose of, at pleasure; but it is endowed with a soul by the soul of the man who has it.» And they who have no metaphysical system are none the less, whether savage or civilized, naïvely metaphysical. Especially is it true that religion is always and essentially, not merely a matter of feeling and cult, but also a certain theory of reality.

Hence the effort arises to summarize these groups of factors and unite them in some one conception. This attempt leads us to the following preliminary definition of what modern philosophy is attempting to accomplish. Thus defined:—

Philosophy aims to establish, by the valid use of human reason, a harmonizing and unitary view of the world and of human life, based upon the principles presupposed and ascertained by the particular sciences. More briefly said: philosophy is the attempt at a critical and rational system of man's judgments and beliefs that have reference to reality and to the ideals of ethics, art and religion.

Relations of Philosophy to the Particular Sciences.— The definition of philosophy suggests that its relations to the particular sciences may be considered from two somewhat diverse points of view; and when considered from these points of view, the relations themselves divide into two classes. For in the first place, philosophy is critical with respect to the presuppositions, or assumptions of each of the particular sciences; and it aims, by its criticism, to harmonize and unite the conclusions of all the sciences. Philosophy is, therefore, when regarded from this point of view, superior to the particular sciences; it is their critic, judge and arbiter, or referee, so to say. But, on the other hand, philosophy is dependent upon the particular sciences. It cannot, without committing itself to an absurd and irrational attempt and to a course of reasoning doomed to failure, refuse to take its points of starting, its material of facts, laws and subordinate principles, from these same sciences. For philosophy does not purpose to construct a world that shall accord with the fancy and sentiment, however animated and exalted, of the individual, speculative reason. It aims, the rather, to discover upon what universal or most general principles the world *is, in fact, constructed.*

With reference to the critical attitude of philosophy toward the particular sciences it is to be noted that all these sciences have their common presuppositions, or opinions and judgments taken for granted. It is not their business, as such, to discuss the nature, limits and validity of man's cognitive faculties, or the grounds upon which reposes his belief in his power to transcend the particular in his own experience and to know the extra-mentally real; or to settle other problems of a theory of knowledge. Moreover, each one of these sciences has its own convenient and appropriate assumptions. For example, the mathematical and physical sciences assume some sort of reality for space and time; they also assume that these forms of man's apprehension are valid for the actually existing physical bodies, molecules and atoms, for the luminiferous ether and for the emanations from radio-active substances, etc. Physics and chemistry also take it for granted that all these physical beings actually move, combine, separate and enter into an indefinite variety of actual relations to one another. They also assume that forces have some kind of real existence; that these forces are actually conserved and correlated; and that this takes place in some uniform and regular way; that is, they assume the existence and reign of so-called laws. The biological sciences make all these and still other asumptions; for, under any of the numerous current theories of evolution, they claim to be able mentally to represent the order and causal connection of organic forms with one another, the reactions upon the changes in their environment and the laws of their relations, as the actual history of real beings must have taken place, or probably did take place, extending over wide areas of space, during enormous stretches of time.

And in a word: The claim to know what is real and true is an assumption of all the particular sciences. And since the claim is an assumption of all the particular sciences, philosophy, as a so-called epistemology or theory of knowledge, becomes in this way the critic of them all. Moreover, as metaphysics or theory of reality, it examines critically the real meaning and validity of these assumptions. Thus it inquires: What is the real nature of space; and what is it really to be in space? What is the real nature of time; and what is it really to exist, or to continue, in time, etc.? Again, all real beings — both things and minds — are regarded as occupying time; and things, at least, are said to occupy space. What, then, is it to occupy space and time; as the beings of the world of our experience must do, in order to be known as real? And still further: What sort of reality attaches itself to the conception of force (or its modern substitute in physics — namely, energy)? and — more puzzling question still: What takes place in actuality when force is said to be stored, or set free; or when the energy is called that of position or that of motion? Motion itself, when considered as really taking place and as anything more than a subjective change in relations of apparent position, offers many puzzling problems to our philosophical inquiries. But, perhaps, most complicated of all is the question: What is it to be a cause, to cause and to be caused, etc.?

Moreover, the particular sciences, in dependence on their assumptions, are constantly increasing and modifying the stock of their conclusions regarding the real nature of the beings of the world and regarding the actual character of the relations between these beings and of their transactions in the time of the world's history. All these principal conclusions are of interest to philosophy. It accepts them gratefully, so far as they may be regarded as proved or highly probable, from the hands of the workers in the particular sciences.

This need of the critical and harmonizing work of philosophy becomes the more clear when we consider another side of human experience with which another group of the particular sciences attempts to deal. This group of sciences is especially connected with that branch of philosophy which deals with the problems of human life. But the solution of these problems requires the consideration of certain facts of a quite different order from those with which the physico-chemical, or even the biological sciences, as such, are competent to deal. What are called value-judgments — or judgments which express not merely the mental apprehension of the truth of fact and law, but the mental appreciation of the worth of certain facts, ideas, emotions and ideals — offer many interesting problems for the student of human life. Most of these problems concern the genesis, development, grounds and ultimate nature, of what men believe and think «ought to be,» rather than what they conjecture or know, «actually is.» But several of the particular sciences attempt to deal with this same class of problems. These particular sciences, too, although they are generally, in themselves, more philosophical than are the physico-chemical sciences, have their own assumptions and arrive at a more or less defensible system of conclusions respecting matters of fact. For the feelings and judgments and ideals of what ought to be are themselves facts of human experience.

Philosophy and science come into peculiarly intimate and important relations, when the phenomena of the religious consciousness and religious development of the race are subjected to study by the historical and psychological methods. Anthropology and comparative history are making it more and more evident that man is essentially a religious being; while psychology is just beginning to show how deeply seated in all his various conscious functions, as well as in what is figuratively called his subliminal self, is the religious experience of man. The three allied sciences of psychology, anthropology and comparative history are, therefore, all exceedingly busy just now in the collection and discussion of the data necessary to frame a so-called science of religion.

Numerous instances, to illustrate and enforce this function of philosophy in its relations to all the particular sciences, might be brought forward. But one or two are sufficient for the present purpose. The chemico-physical sciences, and the sciences of biology, psychology and anthropology, as influenced by the chemico-physical sciences, have been forming a more and more complete conception of man as, himself a piece of intricate mechanism, set in the totality of a vast natural system, a natural universe, mechanically conceived. Thus placed, the individual and the whole race are regarded as strictly determined in all their actions and development, after the analogy of a chemico-physical system or organism. But such a mechanical conception of human nature, of its functioning and its development, has never seemed satisfactory to morals, to art or to religion. Hence there has been and still is a contention between the two —«a long-standing and unsettled strife»— as to the right conception of man and of his place in the universe. Philosophy must mediate in this strife. It asks: What is it to be a cause; and are things and minds causally related in the same way? It aims to harmonize the demands of the physico-chemical sciences with the feelings, value-judgments and ideals, of the moral, æsthetical and religious consciousness of man.

Or again: the physico-chemical sciences think it right to insist upon such a conception of the Being of the World as shall represent it in terms of impersonal forces, and of a universal but unconscious and purposeless ordering of its own affairs. *It* (or Nature) behaves thus and so; and it develops as it does, in accordance with its own inherent forces and immutable laws. These sciences are naturally and properly shy of what they call anthropomorphism. They think that the Being of the World is not scientifically conceived of, when the conception is anthropomorphic. But morals, and art, and religion, are naturally and properly careful to conserve the interests of the feelings, judgments of worth and ideals, in which, so to say, their most valuable assets chiefly consist. They are, therefore, more indulgent to the imagination and intellect in their combined effort to construct a picture of the Being of the World, which shall not violate, but shall on the contrary satisfy, these ethical, æsthetical and religious interests. Such an effort is necessarily anthropomorphic in a different way from that in which the chemico-physical sciences think it altogether safe to indulge themselves. Thus morals, art and religion make the Being of the World, good, and beautiful, and worshipful, — in brief, an ideal personal Being. That which the former sciences conceive of as an impersonal system of forces and laws the ideals of the mind prefer to conceive of as perfect ethical spirit, to be admired, worshipped and obeyed, as God. But philosophy must exercise, in a supremely important way, its harmonizing offices in the attempt at a solution of this great problem.

The number of subordinate problems, in the consideration of which the reconciling office of philosophy is helpful and indeed indispensable, is not small. But the end which philosophy diligently and unswervingly pursues has already been described; it is the forming of a harmonizing and unitary view of the world and of human life.

Philosophy and Psychology.— Among the particular sciences there is one which stands in a peculiarly intimate relation to every branch of philosophical discipline. This science is psychology. Indeed, so intimately related are psychology and philosophy that some writers have insisted upon the impossibility of distinguishing between the two. But this is an exaggeration of the real state of the case. The modern science of psychology aims to treat by scientific methods the phenomena of human consciousness in such manner as to form a valid conception of the nature, genesis and laws of the development of man's mental life. It, therefore, admits of many subordinate and yet cognate divisions. It concerns itself downward, so to say, with the psychical life of the lower animals, with the facts and laws of human physiology, and especially with the science of nervous phenomena; and outward and backward in history, with anthropological and antiquarian researches. In its method it does not neglect the study, from the psychological point of view, of the products of the human mind, in the other sciences, in literature, in art and in philosophy. It even regards history itself as man's will and intellect, written in the large. But psychology also leads onward and upward into philosophy, in a very imperative way.

The relations between psychology and philosophy are so intimate that, in many cases, the two have been — as has already been said — largely, or almost wholly, identified. This has especially been true of English philosophy. For example, Locke's 'Essay Concerning Human Understanding' has been called — although improperly —«the most important offspring of modern philosophy.» But its author describes his purpose to be an inquiry «into the original, certainty, and extent of human knowledge, together with the grounds of belief, opinion, and assent.» This inquiry necessarily raises problems which we should now say belong to psychology, and also to that branch of philosophy which is called epistemology; but it does not completely cover the field of either psychology or philosophy. A modern English writer (Ward) has maintained that we cannot define psychology at all, because we cannot distinguish, at the outset, «what takes place in the mind» from «what takes place without»; and a distinguished German psychologist (Wundt) affirms that the partition of sovereignty between psychology and philosophy is an abstract scheme which, in the presence of the real facts, always appears unsatisfactory.

The modern view, however, is distinctly favorable to separating, as far as possible, between the spheres of psychology and philosophy, and to treating psychology as one of the particular sciences. Thus understood, this science will collect, compare, analyze and discuss the phenomena of man's mental life, with a view to a tenable theory of the nature and development of the so-called human soul, or mind. Without doubt many of the particular problems of psychology may be and should be treated by the scientific method, and after making only such naive assumptions as are necessary to all the positive sciences. On the other hand, it is apparent that the deeper probing of even those problems almost irresistibly leads to such discussions of the nature and authority of consciousness, and the nature and relation to the "outside" world, of the human mind, as demand the methods of reflective thinking, in a word, need philosophizing. For example, the problem of sense-perception, or our knowledge of things by the senses, is primarily a problem for psychology. But the study of sense-perception soon compels the recognition of a certain belief in the reality, both of the objects perceived and of the perceiving self, and in the actuality of relations of interaction between the two. From the beginning the different schools of philosophy have divided sharply over the nature, grounds and validity of this belief; and over the nature, grounds and validity of the distinctions implied, between the perceiving self and the object which is perceived.

In this connection it should also be said that psychology, like all the other particular sciences, has its own assumptions, or points of view and conception, which have not yet been critically examined. For example, the study of the science of psychology assumes that the mind is real, and that the things it perceives by the senses are real; that knowledge of the mind and of things is possible; and, also, that the common-sense cenceptions of space, time, force, relation and all the other so-called categories are sufficiently accurate for beginning its scientific pursuits. But philosophy challenges and criticises all these assumptions.

It would appear reasonable, then, to respect this intimate and necessary relation between psychology and philosophy, in the following way. The former, when pursued as a science, should be allowed the same rights in making its preliminary assumptions, and in arriving at its conclusions, as those which belong to all the particular sciences. But psychology should, as far as possible, recognize the fact that in the more speculative solution of the problems to which its pursuit inevitably leads, it is itself dependent upon philosophy; and, finally, that philosophy is something much more than a higher stage of psychology; for philosophy aims at a rational system of the conceptions and principles, presupposed or ascertained by *all* the particular sciences.

Divisions of Philosophy.— Like every other vast field of human research, philosophy needs to have made some specific allotment of its different aspects, if not of its wholly separable portions. The problem of making this allotment is the problem of division. Its inquiry is: How many, and what, are the different main branches of the general subject? But like every other similar problem in scientific division, the realities to be considered do not follow any strictly logical order; nor do they observe definitely fixed bounds to their relations, in a way to favor only one method of division. For these reasons different writers on the subject have advocated different ways of dividing the general field of philosophy. Nor do we attach any super-eminent claims to excellence for the scheme of division we are about to propose.

In every attempt at systemizing the problems of philosophy, two considerations should be borne in mind: (1) These problems are all interdependently related to one another; and they all sustain the relations which have already been described, to certain of the particular sciences. But, at the same time, (2) these various problems require treatment in a manner to contribute toward the attainment of the final purpose of philosophy. This we have seen to be a reconciling and uniting view of nature and of human life.

The following table expresses, according to our views, the truth of philosophy in the division of its different chief problems:—

I. Philosophy of the Real [Metaphysics, in the wider meaning of the word]	1. Theory of Knowledge [Or Epistemology, Noëtics]	
	2. Theory of Reality [Ontology, or Metaphysics in the narrower meaning of the word]: with its two branches	A. Philosophy of Mind B. Philosophy of Nature (or of physics, etc.)
II. Philosophy of the Ideal [Or of that which ought to be: Idealology, or Rational Teleology]	1. Ethics, or the Ideal of Conduct [Metaphysics of Ethics, Moral Philosophy or Practical Philosophy] 2. Æsthetics, or the Ideal of Art [Philosophy of the Beautiful]	
III. Philosophy of the Absolute [or the Supreme Ideal-Real]	This endeavors so to conceive of the Being of the World, or the Ultimate Reality, as to unite the conclusions of the other branches of philosophy.	

Different Main Branches of Philosophy.— It now remains only to describe, in the briefest manner possible, the different groups of problems which correspond to the divisions of philosophy indicated in the table given above. Among these we have to notice:—

The Theory of Knowledge or Epistemology.— In the second edition of his 'Critique of Pure Reason' Kant affirms that "philosophy requires a science to determine *a priori* the possibility, the principles, and the extent of all cognitions." Modifying this statement somewhat, we may say that epistemology investigates the universal and permanent factors of our experience in a way to answer these three questions: (1) What really is knowledge? (2) What are the limits of human knowledge? and (3) What is the nature and guaranty of the certainty of knowledge? The position of philosophy toward all these questions is that of critical inquiry. In taking this position the mind makes the effort to strip itself of all prejudices and even of all presuppositions; and, by a process of patient and thorough reflective thinking, to probe to the bottom its own cognitive powers. Thus we have before us the somewhat strange and intensely interesting spectacle of the knowing mind striving to know itself as knower: — to understand its own doubts and beliefs, the principles upon which its life of knowledge bases its existence and growth, and the nature and direction of the barriers to its knowing powers which are set by its own constitution, or by the fixed relations in which its activities stand to its own objects.

The limits of this article do not permit that we should discuss at length the problems themselves and the answers arrived at by the different schools of philosophy, in this branch of its manifold investigations. It must suffice to say that the one most important point of difference concerns the relation in which those mental states which we call cognitive — or states of knowledge — stand to extramental realities. Upon this point we find the extreme so-called idealistic school, or school of phenomenalism, holding that, for every individual mind, only its own states can be known; or, in a word, all knowledge is of phenomena; and all known phenomena must be subjective, or modifications of consciousness that can be relied on only to tell the truth about themselves. On the other hand we find those who claim that knowledge is, always and essentially, some sort of an envisagement, or immediate apprehension, of reality; and that this claim is as true for things as for our own selves. Between these two views on the epistemological problem lie many others of a mediating sort.

Theory of Reality, or Ontology.— This same branch of philosophy is also properly called metaphysics, in the narrower meaning of the word. In its most general form its attention is directed upon the problem, What is reality? More elaborately expressed we may say that metaphysics is the critical and systematic exposition of those necessary conceptions and presuppositions which enter into man's cognition of what he considers to be real. Popularly said, this branch of philosophy strives to answer the question: What is it to be real?

Now even a superficial and preliminary examination is enough to show that there are certain conceptions which the mind, always and of the strictest necessity, applies to every kind of a real object. Such conceptions have been called «categories.» For this reason, a doctrine of ontology has sometimes, not inaptly, been spoken of as a criticism of the categories,— meaning, by this word, the conceptions which are always and necessarily applied to all beings considered to be real, and to all events considered to be actual (as distinguished from non-existent or imaginary).

But there are two different classes of real beings — namely, minds or selves, and things or non-self-like existences. And these two do not really exist under precisely the same conditions, or display precisely the same essential qualities, or enter into precisely the same relations, whether among themselves or between each other. Things and Minds are, then, essentially unlike in respect of some qualities which they must have, respectively, in order to exist at all. Moreover, the kind of energy which things and minds display, and the actual dynamical relations into which they can enter with other beings, are markedly different. General metaphysical philosophy is divided, then, into the Philosophy of Mind and the Philosophy of Nature.

The Philosophy of Mind.— The primary object of this branch of philosophy is to determine what claim to reality, and to a place in the system of real things, can be established for the Ego, or subject of mental states. The skeptical and phenomenalistic view regards the mind as merely a succession of states. The now old-fashioned theory of mental substance regarded man's soul as some sort of an entity that might be conceived of as existing in reality, without, however, doing anything or showing its peculiar forms of active life in any way. The modern theory of the nature of mind is more dynamical, as it were. It finds the essential core of the being of mind in activity; and it tries to determine the nature of this being by studying the mental life as a development of more and more complex combinations of permanent forms of activity. This form of examination it applies to the critical inquiry after an answer to such problems as follows: What is it really to be as all minds are? What is the character of that unity which belongs to the mind?— at least, in its normal and developed condition, however such unitary being may be disturbed by double (or triple) consciousness, and other similar phenomena. Thus the inquiries of this branch of philosophy have a very important bearing on the questions which religion raises with regard to the nature, origin and probable destiny of the human soul, and of the race.

The Philosophy of Nature.— It is not sufficiently recognized that a very large proportion of the entire body of the modern natural and physical sciences is really metaphysical, in the strictest meaning of the latter term. Moreover, the metaphysics of the chemico-physical and biological sciences is of the most subtle, elaborate and difficult character. No one can doubt this who has attempted even partially to understand the modern conceptions of atoms, electricity, ether, physical energy, the constitution of matter and the nature of the relations sustained to one another by different material existences. And, indeed, the new discoveries as to the existence and behavior of radio-active substances, and their emanations, of germ-cells and their developments, are complicating enormously the metaphysics of these sciences. The truth is that the metaphysics of things (or the philosophy of nature) is much more obscure, complex and at present purely tentative, than is the metaphysics of mind. On the other hand, the amount of patient research and the order of talent given to this branch of philosophy at present are such as to encourage the most hopeful attitude toward its future developments. What are the essential qualities, what the universal and permanent relations, what the laws and final purposes, of material things, are philosophical questions which physics, chemistry and biology are now investigating in a most productive manner.

Ethics, as the Philosophy of Conduct.— The opinions of men as to the right and wrong of conduct may profitably be studied from the historical point of view. A study, by the methods of psychology, of the nature of man as fitted for conduct and for the development of moral character, furnishes further material for an attempt at a science of ethics. But all such empirical methods of examining the problems of morality only raise, but do not solve, the more ultimate and profoundly interesting problems. Among these are such as the following: What is the essential nature of the morally right? What is the authority and guaranty of the feeling of obligation to do the right? (As Kant would propose the question: How can there be a categorical imperative?) But, finally, what ground, that is universal and unchanging, can be found for the morally right, in the real being of the world? Such questions as these define the sphere of the metaphysics of ethics.

Closely akin to these are the questions propounded to æsthetics.

Æsthetics, as the Philosophy of the Beautiful.— Here again the historical study of art and of the development of opinion and feeling respecting beautiful objects, as well as the analysis of so-called æsthetical consciousness, only raises, but does not answer, the questions of chief interest to philosophy. Such study shows that man has always regarded the characteristics of beauty as not merely subjective, but as really belonging to the object. The beautiful is distinguished from the sensuously agreeable by the possession of two characteristics in a special way: these are objective validity and ideal worth. Hence the inquiry arises for a ground of that which seems to human consciousness to be possessed of these characteristics; and that ground philosophy aims to place in the Being of the World. But this is equivalent to regarding this being as an ideal life, conceived of after the analogy of the human spirit. It is this feeling of kinship for the beautiful in nature, of which even the rudest and most savage of mankind show manifest signs, that led the poet (Byron) to exclaim:

> "Are not the mountains, waves, and skies a part
> Of me and of my soul, as I of them?"

It is obvious, however, that such personifying of that system of things which science calls nature, must provoke much skeptical criticism; whether the personifying take the form of constructing this system in terms of the ideal of ethics or of the ideal of æsthetics. In this way the mind is challenged and directed in its renewed effort to perform the supreme task of systematic philosophy.

The Philosophy of the Absolute (or Supreme Ideal-Real.)— All the other branches, therefore, lead up toward and are auxiliary to the philosophy of the absolute. In this way the reflective thinking of humanity makes its constantly renewed and developing, but never completely satisfying and final, effort at a supreme synthesis. It attempts to reach such a conception of the Being of the World, or the universe considered as the manifestation of an essential unity, as shall accord with the facts and laws of the particular sciences, both physical and psychological, and at the same time harmonize their differences and seeming contradictions. In this attempt metaphysics comes into closest relations with the so-called philosophy of religion.

Besides the phenomena of man's ethical and artistic life and development, we have to notice those of his religious life and development. The conception of the Being of the World to which the highest religious development of humanity has attained is that of a perfect ethical spirit, into moral and spiritual relations with whom man may come by voluntary acts of communion and service. Philosophy, therefore, has before it the final problem of striving to satisfy all the various demands of man's many-sided nature and development in the conception which it presents of the Ultimate Reality, or the World-Ground. The appropriate name which philosophy bestows upon its conception of this unitary being is the Absolute. [It should be borne in mind, however, that such terms as «absolute,» «infinite,» «unconditioned,» etc., can never be employed in a quite unlimited way. Thus «absolute» means freed from conditions of dependence, not from all conditions whatever; «infinite» means, without certain kinds of limitation, not wholly indeterminate, a merely negative conception, etc.].

The most profound and important questions debated by the different schools of philosophy, from the beginning of its existence in any systematic form up to the present time have, therefore, concerned the nature of, and relation of mankind to, this so-called Absolute. But the differences of opinion existing between these different schools may be best summarized by saying that they concern the character and the amount of personality which may properly be attributed to «the Absolute.» On this point we find one extreme claiming that the two conceptions — namely, of absoluteness and personality — are not only incompatible, but antagonistic. On the other hand, the conclusions of psychology, philosophy of mind, epistemology, and even a theory of reality based upon the conceptions of science, are being summoned to show that all human thinking and living is conditioned upon the essential personality of the Absolute, or likeness of the environing world to the human self. And perhaps it is no exaggeration to say that some such form of an ideal-realism is just now the kind of philosophy which divides the field of reflective thinking with those who still cling to the skeptical position of phenomenalism.

The Benefits of Philosophy.— It is customary to bring the ceaseless discussion of the ultimate problems of philosophy, and the alleged fruitlessness of this discussion, as a serious and even conclusive charge against the usefulness of philosophy. To answer this charge fully it would be necessary to pass in review the entire history of man's development in reflective thinking. This history would show conclusively that every great movement in science, art, morals, religion, and even in politics and social affairs, has been profoundly influenced by the pre-existing and current philosophical opinions. And if this influence has ever been injurious to, or restrictive of, human welfare, its only counteracting influence has arisen out of the same source,— namely, the renewed and better use of human reason in the discovery of the complete and final truth touching the nature of reality.

But it is not true that the discussion of philosophical problems has been fruitless or, on the whole, harmful to the best interests of mankind. On the contrary, it may be successfully maintained that no other form of man's higher life has made more essential progress, or has contributed more to other forms of progress, than has philosophy;— when the term is understood in the broad and generous way in which we have tried to interpret it. For in philosophy, man's reason reaches its supreme expression of the striving after what is ideally best; and this is to know one's self and one's fellows, the world and God, in a more profound manner, and so as to satisfy the entire intellectual, ethical, æsthetical and religious needs of the soul.

It will appear that our effort has been, not to advocate any special system of philosophy, but, the rather, to describe what philosophy in its modern form essentially is; what method it employs for the solution of its problem; and what are the principal problems which give occasion for division into the main types of philosophy. Even this limited discussion of the subjects, however, suggests certain considerations which concern every man's choice of position toward philosophy in general and toward its contending systems. We mention some of the more important of these considerations:

1. The method of all philosophy is essentially rationalistic. To philosophize is to use the reason, or the reflective powers of the human mind, in the search for an answer to the profounder problems of existence and of human life. Criticism, and even scepticism of the most unlimited kind, have no other method that is tolerable to the most shallow conception of what philosophy is, than the rationalistic. In this meaning of the word, all philosophical opinion is some form of Rationalism.

2. Philosophical criticism, like every other use of the critical faculties, implies an indestructible faith in the authority and validity of reason. The very last and most impossible thing for a mind endowed only with powers of sensation and animal intellection to accomplish, or even to undertake, would be the task of self-criticism. From this it follows that a complete and unlimited scepticism is suicidal. Especially in the form called solipsism, or skeptical idealism, is this statement manifestly true. You cannot argue that only knowledge of the self by the self is possible, without implying the existence of other selves, known by the self that argues to be really existent and actually in the exercise of essentially the same rational faculties.

3. It follows further that all philosophy is necessarily to some extent realistic, is indeed some form of Realism. To begin the process of reflective thinking with the denial of all cognition of actual facts and real existences is to attempt the impossible. All thinking, and especially all philosophizing, assumes some ground of standing in actual happenings and real existences. Something is real. But what is real; and what is it to be real?

4. But especially true is it that every system of philosophy is, essentially considered, some of Idealism. The existence and potent influence of human ideals are as obvious and determining of opinion, in the most rigidly mechanical doctrines of the human soul and of the universe of things, as they are in the wildest flights of Plato's imagination in the 'Timæus,' or in the most mystical of the writings of Brahmanism or Buddhism. The question remains for philosophy ever anew to strive the better and the more fully to answer: What are the ideals actually followed in the constitution and ongoings of the world of things, and in the constitution and development of the human soul?

5. Philosophy, like all the other endeavors of the human mind, and like the particular sciences and special forms of social union undertaken by the race, is under the laws that control all human development. These laws are involved in immensely complicated phenomena, and as yet are far from being brought within the grasp of the human understanding. But the facts suffice to warrant the affirmation that philosophy, like all other forms of human development, is essentially teleological. It is aimed toward some far-distant goal, in the supreme excellence of which the ethical, æsthetical and religious ideals of reason encourage and support an undying confidence.

Bibliography.— For the detailed opinions of the writers on the problems of philosophy, besides the 'Introduction to Philosophy,' the following treaties may be consulted: 'Philosophy of Mind'; 'A Theory of Reality'; 'Philosophy of Knowledge'; 'Philosophy of Conduct'; 'Philosophy of Religion' (2 vols.). The following list is chosen from books most accessible and most likely to be profitable for the average reader:

GENERAL PHILOSOPHY.— Külpe, 'Introduction to Philosophy'; Robertson, 'Elements of General Philosophy'; Watson, 'An Outline of Philosophy'; Russell, B., 'The Problems of Philosophy'; Russell, J. E., 'First Course in Philosophy'; Sidgwick, H., 'Philosophy, its Scope and Relations'; Höffding, H., 'The Problems of Philosophy'; Bergson 'Creative Evolution.'

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METAPHYSICS.— Bradley, 'Appearance and Reality'; Mackenzie, 'Outlines of Metaphysics'; Bosanquet, 'Nature and Value of Individuality'; Royce, 'The World and the Individual'; Taylor, A. E., 'Elements of Metaphysics.'

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ÆSTHETICS.— Marshall, 'Pain, Pleasure and Æsthetics'; Santayana, 'Sense of Beauty'; Puffer, 'The Psychology of Beauty'; Begg, 'The Development of Taste'; Broze, B., 'Æsthetics'; Davies, 'Art in Education and Life.'

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phy and Development of Religion'; Tiele, 'Elements of the Science of Religion'; Balfour, 'The Foundations of Belief' and 'Theism and Humanism'; Ward, 'Pluralism and Theism'; Caird, Ed., 'The Evolution of Religion'; Fairbairn, 'Philosophy of Christian Religion'; Hocking, W. E., 'The Meaning of God in Human Experience'; Höffding, H., 'The Philosophy of Religion'; Pringle-Patterson, 'The Idea of God in the Light of Recent Philosophy.'

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PHILOSOPHY, History of. The history of philosophy has a peculiarly close and vital relation to philosophy itself. It may even be said to form an essential and integral part of philosophical discipline. While a knowledge of the history of every science is of great service in aiding one to comprehend its standpoint and fundamental hypotheses, insight into the genesis and historical development of philosophical problems and conceptions is in philosophy a primary and essential requirement. For, in the first place, these conceptions are not the work of any single mind, or the possession of any particular school. They are the outcome of a long line of development to which many ages have contributed, and in which many individuals have borne a part. Even where different systems seem to be directly opposed as they successively make their appearance in history, the new is never a mere denial or displacement of the old, but is connected with it by positive lines of relation. And ultimately nothing which is of value is ever lost, but is taken up and preserved in the later systems. In short, the history of philosophy presents an account of the evolution of human thinking in one of its most universal aspects. It deals with the development of the process in which the race has attempted to express in scientific form its views regarding the nature of the world and its interpretation of life. These are problems to which the human mind must in every age seek to find an answer. The form of these inquiries, however, can never remain unchanged. For the object that every philosophical thinker seeks to understand is the world as it is known to him and to his generation. As new material is brought to light by the advances of the special sciences, or as the changing interests of practical life bring now this and now that aspect of reality into prominence, and thus leading to a modification of the standards of value, the problems of philosophy get new formulations, and the old systems show their inadequacy and need of revision. We may, therefore, say that the history of philosophy gives an account of the process in which the human spirit becomes constantly more clearly and definitely conscious of itself and its relation to the world. The task of philosophy, which accordingly consists in defining more clearly at once the nature of the self and of the world, must be undertaken anew by the thinkers of each generation. No age can rest in the definitions of the past. But, on the other hand, it is only in the light of the past that the thinkers of any particular age can understand their own problems. It is only by building upon the foundations already laid, by continuing the work of their predecessors, that they are able to accomplish anything of value. A philosopher's best originality consists in developing, and thus rendering more exact and definite, the thoughts of those who have gone before him. It is true that he must work in the light of the science and practical insight of his day; but, in order to produce valuable results, it is necessary that his reason should be illumined by the philosophical conceptions and principles which have proved their fruitfulness in the great systems of the past.

There is, of course, a fundamental difference between this conception of the history of philosophy and that formerly prevailing which looked on it as a record of the opinions of individual thinkers whose theories had no positive or essential relation to one another. From this standpoint, the history of philosophy possesses merely an antiquarian interest. It leads us through a road strewn with the wreckage of discarded theories and broken-down systems. Oftentimes the diversity of opinion which it presents is taken as a proof that the goal which philosophy seeks to reach is unattainable, and its problems insoluble. In spite of the prevalence of the notion of development, this view of the history of philosophy still persists in some quarters. The conception of the history of philosophy as a process of development was, however, clearly formulated by Hegel (q.v.) a century ago. This conception gave a new significance to the historical facts and aided in arousing a new interest in their investigation. By Hegel himself, however, the development was conceived in a wholly logical sense. That is, he conceived the progress from age to age as determined wholly by the inner necessity with which inconsistent and inadequate thoughts lead on in a regular and absolutely necessary order to their own refutation and correction. As a result of this logical interpretation, Hegel was led to force the facts of the history of philosophy into an artificial scheme of thesis, antithesis and synthesis, corresponding to the universal thought movement as laid down in his 'Logic.' Moreover, in the light of this logical interpretation, the history of philosophy appears as an impersonal process of development characterized by inner necessity, where the individual thinkers seem to determine nothing through their free personality, but merely to represent a certain inevitable stage in the evolution of the thought of the race. In spite, therefore, of the great service which it has rendered, Hegel's conception has serious defects. For while fully admitting the importance of the logical factor, it is impossible to forget that the development of philosophy is the work of individual thinkers, whose conceptions spring from their own personal life, and that its progress is also modified by the general culture and prevalent interests of the times in which it makes its appearance. In investigating the history of philosophy, then, these various factors must be given due place. The task which investigation in this field has to perform has been stated under the following three headings by Windelband ('History of Philosophy,' § 2, 6): (1) "To establish with precision what may be derived from the available sources as to the circumstances in life, the mental development, and the doctrines of individual philosophers; (2) from these facts to reconstruct the genetic process in such a way that in the case of every philosopher we may understand how his doctrines depend in part upon those of his predecessors, in part upon the general ideas of his time, and in part upon his own nature and the course of his education; (3) from the consideration of the whole to estimate what value for the total result of the history of philosophy belongs to the theories thus established and explained with respect to their origin.»

Philosophy, so far at least as it forms a part of the culture of the Western nations, took its rise in Greece in the 6th century B.C., and was developed by the independent thinking of the people of the Western world. Whether there existed anything that may properly be called philosophy among any of the Oriental peoples, particularly among those of India and China, or whether the so-called Oriental philosophy does not rather belong to the history of religion, are questions that may here be left undecided. Philosophy, as it is known to the Western world, may conveniently be divided into an ancient, a mediæval and a modern period. Ancient philosophy is almost entirely the product of Greek thought, and was first developed in the Greek colonies of Asia Minor in the East, and in Sicily and Italy in the West. It reached its culmination in Athens, and was finally cultivated at Alexandria, and at various points throughout the Greco-Roman world. Greek philosophy falls naturally into the pre-Socratic period, the Socratic School, including Socrates, Plato and Aristotle (qq.v.) and the post-Aristotelian Systems. In this classification the Sophists may perhaps be regarded as a transition link between the first and second periods. Pre-Socratic philosophy was occupied mainly with attempts to explain the nature of the external world and the character of those physical phenomena that most readily attracted attention. According to the generally received account, philosophy had its origin in the 6th century with Thales of Miletus, in Asia Minor, who was followed in the same city by Anaximander and Anaximenes. We say that philosophy, which in its beginnings included all the sciences, had its origin with these men, because, so far as we know, they were the first to advance beyond mythologies, and definitely to raise and seek to answer the problem regarding the natural causes and principles of the world. A little later Pythagoras (q.v.) and his school, who flourished in lower Italy, did good service in developing the mathematical sciences, and also proposed a universal explanation of things couched in terms of numbers. Lower Italy was also the home of the Eleatics, whose greatest representative, Parmenides, taught the unchanging and unitary character of that which truly is. About the same time Heraclitus was maintaining at Ephesus, in Asia Minor, that everything is in process of change and becoming, and that nowhere is there to be found any permanent static being. To reconcile the opposition between the views of Parmenides and Heraclitus, both of which seemed to be justified by experience, later thinkers, Empedocles, Anaxagoras and the Atomists, while differing in important respects from each other, agreed in adopting a plurality of fixed, unchanging elements which are constantly forming new combinations by their union and being dissolved in turn. Thus while elements remain unchanged, what we call things are in constant process of transition.

The work of the Sophists was almost entirely critical and destructive. They are significant, however, as first calling attention to the subjective side of experience. This took the form of an assertion that knowledge exists only as sensations and feelings in individual minds, and that, therefore, there is no standard beyond the individual of truth or of moral values. The Sophistic skepticism was met and refuted by Socrates and his pupil Plato (q.v.), who showed, by a more thoroughgoing analysis of the nature of conscious experience, that in reason, as opposed to sense-perception, man possesses a standard both of theoretical and of practical truth. Aristotle organized the special sciences on the basis provided by his predecessors, and defined their field of inquiry, while at the same time applying and making more concrete in the field of philosophy the idealistic principles of Plato. During the post-Aristotelian period, the philosophical interest was mainly ethical and practical. The reasons for this are to be found in the political conditions of the time. The Greek states had lost their independence, and when the social and political institutions, which embodied the laws of life and conduct for the Greek in objective form, had thus collapsed, it became necessary for the individual to seek to find in his own nature the principles of practical guidance that life demands. At the same time, theoretical problems were not entirely abandoned, though in general they were subordinated to practice. Both the Stoics and Epicureans made philosophy include logic and physics as well as ethics, but both alike regard the two former disciplines merely as means, and the last alone as the true end. These two schools were founded at Athens at very nearly the same time (about 300 B.C.), the former by Zeno (q.v.), and the latter by Epicurus (q.v.). The Stoics taught a system of materialistic pantheism, which they drew largely from Heraclitus. In ethics, where their teachings are of the greatest importance, they emphasize the necessity of self-restraint and of independence of external goods and outward circumstances. They maintained that the highest good consisted in the attainment of virtue, and that this was entirely different in character from personal happiness or satisfaction. The school of Epicurus, on the other hand, based their account of the physical world upon Atomism, and in ethics they regard the rational pursuit of pleasure as the end of life. Skepticism made its appearance in Greek philosophy with Pyrrho (q.v.) (360–270 B.C.), in the school of the Academy with Arcesilaus about the time of Alexander the Great, and among a group of later thinkers in the 3d century of the Christian era. We find the skeptical arguments and difficulties which are familiar in modern times elaborated in great detail and urged with remarkable acuteness by these writers, particularly by Sextus Empiricus. Eclecticism (q.v.) flourished especially at Alexandria, where Philo (q.v.) sought to unite Hebrew theology and Greek philosophy, and among the Romans, where writers like Cicero (q.v.) selected freely whatever doctrines commended themselves in the various systems of Greek thought. Greek philosophy ends in Neo-Platonism (q.v.), which is a species of mystical theosophy. It abandons the attempt to discover ultimate truth by means of logical thought, and seeks to comprehend all things in their immediate relation to God by inducing, from time to time, a state of ecstasy in which the limitations of ordinary consciousness are transcended, and the highest truths are apprehended in direct intuitive vision.

The ideas and conceptions introduced by Christianity gave a new impulse and direction to philosophical inquiry during the Middle Ages. During this period there was developed the consciousness of a fundamental opposition between God and the world, and in general between the spiritual and the natural. This shows itself in sharp division between Church and State, this life and the future life, priests and laity, etc. Along with this, there went also a sense of man's natural helplessness and lack of freedom, and the futility of all his attempts to save himself without divine grace. Mediæval philosophy may be divided into two main periods, a Patristic and a Scholastic period. These may be described in the words of Ueberweg: «In the patristic period, philosophic thought stands in the closest relation with theological speculation, and co-operates in the development of Christian dogma. In the scholastic period, it passes into the service of theology, being employed merely to reduce to scientific form a body of dogmatic teaching for the most part already at hand, by introducing a logical arrangement, and bringing to its support philosophical doctrines from ante-Christian antiquity.» The work of the Fathers of the Church reached its culmination in Saint Augustine (q.v.) (354–430 A.D.), who, after his conversion to Christianity, employed his profound philosophical genius in explaining and justifying the theological dogmas of the trinity, of predestination and of the origin and nature of the human soul, etc. Scholasticism (q.v.), as Hegel has remarked, is modern science in embryo. It is the form under which the thought of the Western nations was molded and schooled for long centuries. Ostensibly, at least, philosophy during this period was entirely subordinated to the accepted theological doctrines. *Credo ut intelligam* was its professed motto. This subordination, however, was never absolute, and in every generation there were thinkers who modified, and to a greater or less extent rationalized, the teachings of the Church. In spite of the subjection of thought to authority, the history of the whole period shows a gradual though slow awakening on the part of European peoples to the rights of reason, a growing consciousness that thinking, to exist at all, must be free and independent. Early scholastic philosophy was mainly under the influence of Plato and the Neo-Platonic writers. Of Aristotle only the logical writings in the Latin translation of Boethius (q.v.) were known. The most noted names of this period are John Scotus Erigena, Anselm of Canterbury and Abelard (qq.v.). About the beginning of the 13th century, the Catholic scholars became acquainted, through the Arabians, with the other writings of Aristotle; and the great Dominican teacher, Albert Magnus (q.v.), was quick to see how the system of the «heathen» philosopher might be made the support and bulwark of the Church. This led to a revival and transformation of scholasticism. The doctrines of the Church found a new and broader philosophical basis in the profound system of Albert's pupil, Thomas Aquinas (q.v.) (1225–74), which was, however, sharply opposed on some points by the subtle dialectician, John Duns Scotus (q.v.). During the 11th century, and during the first part of the 12th, and again in the last period of scholasticism, philosophical discussion centred round the question of the universal and its relation to the particular object. Realism (q.v.) maintained that the universal is the primary and fundamental reality in which and through which alone particular objects can exist (*universalia ante rem*). Nominalism, on the other hand, contended that the universal was nothing more than a name given to a number of particular objects, and that, therefore, only these have any real existence. It is at once evident that this controversy is only a particular form of the most fundamental problem of all philosophy, the relation of the one and the many. It is also interesting to note that the reappearance of nominalism in the later scholastic period was coincident with, and indeed an expression of the same spirit as, the new interest in natural science and in the observation and study of particular objects by empirical methods.

At the time of the Renaissance (q.v.), philosophy felt the same quickening influence which manifested itself in other fields. This renewed interest was first directed toward a study of other ancient systems besides that of Aristotle, who, as the official philosopher of scholasticism, was in many quarters condemned and decried. Plato and the Neo-Platonists were especially prized, and a Platonic Academy was founded at Florence by Cosmo de' Medici. This revival of the ancient learning was quickly followed by independent investigations in the field of physical phenomena, and to some extent also in that of the phenomena of mind. Here belong the names of Nicolaus Cusanus, Copernicus, Kepler, and, though later, that of Galileo (qq.v.). The results gained by the new science were combined into a monistic and pantheistic view of the world in the philosophical system of Giordano Bruno (q.v.). One of the most important steps taken by these early investigators of nature was the development of the concept of mechanical explanation, and the formulation of its principles in the laws of motion. Descartes (q.v.) applied the conception of mechanism to all the phenomena of the physical universe, reducing them to terms of motion and extension. Descartes was no materialist, however, but maintained the existence of spiritual substances, operating according to their own laws, alongside, and largely independent of, the world of physical bodies. Thomas Hobbes (q.v.), whose theories in ethical and political philosophy are of great historical importance, was the first thinker to be led by the principles of modern science to reduce all classes of phenomena, physical and mental alike, to mechanical terms.

One of the most striking characteristics of early modern thought is found in its consciousness of new problems, and in the resulting sense of a complete break with the past. It was felt that up to this time little or nothing had been discovered. with the exception of mathematics, which could pass as real knowledge. The first demand was for a right method of discovering truth. It was confidently assumed that when this fundamental need was supplied, diligence and co-operation on the part of scientific workers would in a short time reveal all of the important laws of nature. The search for a method of scientific procedure gave rise to Rationalism and Empiricism (qq.v.), the two distinctive philosophical schools in the 17th and 18th centuries. Rationalism endeavors to imitate the procedure of mathematics, which it regarded as furnishing the one species of certain knowledge. It seeks to start, as mathematics does, with a number of axiomatic principles; and by analyzing these, and showing the necessary results to which they lead, it will exhibit its conclusions as a system of demonstrable truth. In this theory of knowledge, observation of particular facts is not emphasized: the organ of knowledge is reason, which proceeds by the road of analysis and deduction. This method, first formulated and employed by Descartes, was most consistently applied by Spinoza (q.v.), and continued with some modifications and additions in the systems of Leibnitz and Wolff (qq.v.). The empirical method, with its inductive procedure, was emphasized and stated in eloquent terms by Francis Bacon (q.v.) in his 'Novum Organum.' Locke's 'Essay Concerning Human Understanding,' however, must be regarded as the starting point of philosophical empiricism. For it refutes in detail the doctrine of innate ideas, and maintains, as its fundamental thesis, that all knowledge is derived from experience, and that experience is given as definite and particular contents which are known to the mind through external sense-perception or through internal observation. Thus the starting point and the essential character of knowledge are found in particular facts passively perceived by the mind, while the activities of mind and the processes and principles of reasoning are proportionately minimized and given a subordinate place. In the development of this doctrine, Bishop Berkeley (q.v.) transformed Locke's "plain historical account" of mind into a system of empirical idealism. A little later, David Hume (q.v.), developing the empirical principles with the consistency and thoroughness of genius, arrived at utter theoretical skepticism regarding any rational basis of experience. Empiricism was also adopted and developed in France, notably by Condillac and Helvétius (qq.v.), but soon passed into naturalism and materialism, which finds its most pronounced expression in von Holbach's 'System of Nature.' Although usually taking an agnostic position on ultimate philosophical questions, empiricism has continued to have its representatives, among whom we may mention the names of David Hartley, Joseph Priestly, James Mill and his son, John Stuart Mill, and Alexander Bain (qq.v.). These writers have dealt mainly, though not exclusively, with psychology, where they have emphasized various forms of the principle of association as a connecting law of mental phenomena.

The skeptical conclusions of Hume were opposed in the name of Common Sense by Thomas Reid (q.v.), the founder of the Scottish school, and by his followers, of whom the most noted are Dugald Stewart (q.v.) and Sir William Hamilton (q.v.) in Scotland, and in America, President James McCosh of Princeton, and President Noah Porter (q.v.) of Yale University. Reid's method, which was somewhat refined and developed by his later followers, consisted in an appeal to the common sense of the plain man in order to establish the existence of certain fundamental principles that were perceived intuitively and immediately both in the realm of theoretical and of practical experience. This method serves to emphasize the fact that there is much in experience which is overlooked by the empirical account; but it was necessary that philosophy should define and exhibit this by a more systematic and scientific method of analysis. This Kant accomplished mainly in his epoch-making work, the 'Kritik of Pure Reason.' Kant showed that experience was not constituted simply by a given content, but that, in order that it should exist, there was also necessary a system of interpretative forms or functions on the part of the mind, and that these find their unity and complete expression in the nature of self-consciousness. He thus at once reconciled and completed the partial views of Empiricism and Rationalism, and, at the same time, furnished philosophy with a new principle and a new method. Nevertheless, Kant himself failed to perceive the full scope of his own principles, and maintained that knowledge can only deal with phenomena or appearances, while the world of things in themselves remains beyond the reach of man's knowing faculties. In the 'Kritik of Practical Reason,' however, he showed that it is admissible and necessary in the light of our moral experience to make certain postulates regarding the nature of the ultimate realities, though these postulates never attain the rank of knowledge, but must always remain matters of faith. In the 'Kritik of Judgment,' Kant attempted to unite the standpoints of the other two critiques, but the result, though very suggestive and historically important, was left in a somewhat indefinite and unsatisfactory state. Kant's philosophy was at once taken up and made the starting point of a notable line of development by three great thinkers, Fichte, Schelling and Hegel (qq.v.). These men all abandoned the absolute distinction between phenomena and things in themselves, and proceeded boldly in somewhat different ways to construct systems of Idealism (q.v.). To describe these briefly, we may say that Fichte's system is Ethical Idealism, finding in the moral life the ultimate explanation and *raison d'être* of the world; that Schelling's main interest is in external nature, which he interprets in terms of Evolutionary Idealism; while Hegel's system is more universal in its scope, and attempts to embrace in a vast logical scheme the complete process of the Absolute Thought, including all the facts of man's life in their historical evolution, as well as the laws and forms of the physical universe. Hegel's philosophy of nature cannot be regarded as successful; and his system contains formal paradoxes and artificialities that have prevented its real value from being generally appreciated. But, with all its defects, it can scarcely be doubted that it furnishes the most complete and satisfactory synthesis of experience that has yet been formulated, and that the progress of modern thought is constantly developing and rendering more concrete its principles. It was Hegel's great achievement to grasp clearly for the first time the conception of history as a rational organic process, and thus to rise to the notion of a dynamic and concrete universal. His ideas have, therefore, proved exceedingly fruitful in the development of social and political philosophy, as well as in the more usual fields of metaphysical speculation.

In Hegel's postulate that the real is the rational and must disclose its nature to thought, we have the culmination of Rationalism. Schopenhauer, on the other hand, maintains in his 'The World as Will and Idea' the doctrine of Irrationalism,— that the world in all its various parts is not the expression of reason at all, but is the manifestation of a blind, purposeless principle, which he calls Will (q.v.). This insistence on Will as opposed to Reason (q.v.) does not, however, result in emphasizing more strongly the ethical life, as with Fichte. For Schopenhauer, Will is a blind impulse which manifests itself in the processes of nature which are usually regarded as purely physical, as well as in the phenomena of life and mind, while its coming to consciousness in man must be regarded as an unessential moment in its nature, and a misfortune. Its very nature is blind, purposeless striving that must forever remain unsatisfied. This is the basis of the Pessimism which Schopenhauer (q.v.) so convincingly enforces. Edward von Hartmann (q.v.), who makes the unconscious the ultimate principle of the universe, and whose system also results in Pessimism (q.v.), may be regarded as a follower of Schopenhauer, though he introduced certain modifications into the latter's system that seem to be derived from Hegel.

In opposition to Idealism, Johann Friedrich Herbart (q.v.) (1776–1841) developed the realistic elements in Kant's philosophy, and advanced a system which he called Realism (q.v.). He maintains the existence of independent beings beyond experience, existing in the form of simple quality-less «reals.» By discarding the reference of mental phenomena to separate faculties and substituting for this formal explanation a statement of their concrete laws and relations, Herbart also contributed largely to the development of psychology as a science. R. H. Lotze (1817–81) shows in some points the influence of Herbart, but criticises keenly the latter's conception of simple independent «reals,» and arrives himself at the notion of reality as a system of souls that are united organically with one another and with the life of the Absolute, while each still retains, in some way, and to some extent, its own independence and freedom. Lotze may thus be described as an ideal realist; or, since he finds the ultimate purpose and explanation of things in the idea of the Good, his system may be described as Ethical or Teleological Idealism.

An important philosophical movement called Positivism (q.v.), which still exerts an important influence in France, was inaugurated by Auguste Comte (1798–1857). By Positivism Comte means a mode of explaining phenomna which rejects all reference to the will of the gods or other superior beings (Theology), or to abstract essences or powers (Metaphysics), and deals solely with the invariable laws of the phenomena themselves. The order of the development of the human mind, and hence of all the sciences, is from the theological, through the metaphysical to the positive point of view. To render sociology, which has been the last in order of development, a positive science was the main object of Comte's writings. Positive philosophy is not a separate discipline, but the synthesis and systematic co-ordination of all the sciences. Since the publication of Darwin's 'Origin of Species' (1859), philosophy, like all other branches of inquiry, has been especially influenced by the concept of evolution, and this notion has affected, to a greater or less extent, both the method and the conclusions of all recent writers. The only comprehensive «system,» however, that has yet appeared, based professedly on this conception, is that of Herbert Spencer (q.v.). In the 'Synthetic Philosophy' Spencer has furnished an account in evolutionary terms of the origin of the physical universe from a primitive nebula, and has also traced the genesis of animal life, and the human mind, as well as the evolution of conduct, and of social life and institutions. He thus aims to give in his philosophy a complete synthesis of the sciences. The question may, however, be raised whether Spencer's adoption of the standpoint and conception of the particular sciences, and especially of the physical sciences, as final, without criticism or modification, does not render his conclusions unsatisfactory as the last word of philosophy.

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PHILOSOPHY, Moral. See ETHICS.

PHILOSTRATUS, fĭ-lŏs'trạ-tŭs, **Flavius**, («The Elder»), Greek Sophist and rhetorician: b. Lemnos about the middle of the 2d century A.D. Few facts regarding his life have come down to us. We know that he taught rhetoric at Athens and subsequently at Rome, where he obtained the favor of the Emperor Septimus Severus, and was received into the circle of literati that the Empress Julia Domina had gathered around her. His principal work is his 'Life of Apollonius of Tyana,' which is regarded as rather fiction than history. His other works include the 'Heroicus,' dealing with the Trojan War; the 'Eikones,' a description of certain paintings the author says he had seen at Naples; 'Vitæ Sophistarum,' or the lives of several of the Sophists; and 'Letters.'

PHILOXENIAN (fĭl-ŏk-sē'nĭ-ạn) **VERSION OF THE BIBLE**, a translation of the Greek version of the Hebrew Scriptures and of the New Testament books into Syriac, made by Philoxenus (or Asenaya), bishop of Mabbogh, early in the 6th century for the use of his coreligionists of the Monophysite or Jacobite sect or branch of the Syrian Church, the Peshitto version, already in existence, being deemed unfaithful. Philoxenus' version was highly esteemed by his contemporaries: he was one of the most eminent writers of Syriac; but his version of the Bible was superseded by two others, and only fragments of it are extant.

PHILOXENUS, fĭ-lŏk'sĕ-nŭs, Greek dithyrambic poet: b. 435 B.C.; d. 380 B.C. He was originally from Cythera, and upon the capture of the island was taken as a prisoner of war to Athens, where he became the slave of Melanippides, the musician, who educated and freed him. For a considerable time he lived at the court of Dionysius I of Syracuse. He severely wounded the vanity of the tyrant by refusing to praise the latter's verses, declaring, on being given one to revise, that the best revision would be to draw a black line through the entire production. As a result he was put in prison; he either escaped thence or soon after his release left the court. He wrote 24 dithyrambs, including the 'Cyclops,' his most celebrated work, and the 'Deipnon' ('Banquet'), of each of which fragments remain. He was long highly esteemed; and so late as the time of Polybius his dithyrambs were annually presented by the Arcadians.

PHILTRE, fĭl'tĕr, in popular superstition, a love powder or love potion. From the earliest times it has been supposed that there were means by which love could not only be excited but be directed to a particular object. Various substances from the animal and vegetable kingdoms have been used for this purpose, some disgusting, some injurious, some without any distinguishing character. The truth is, that physical desire may be produced by physical stimuli, which are called *aphrodisiacs*, but it is absurd to suppose that such means can produce a passion for a particular object.

PHINEAS FINN, The Irish Member, a novel by Anthony Trollope, published in 1869. Taking its title from the name of its hero it is the earliest of Trollope's political novels and was followed by 'Phineas Redux' (1873); 'The Prime Minister' (1875) and 'The Duke's Children' (1886). In accordance with Trollope's custom of linking one fiction to another by presenting some of the same characters in each, Phineas and many of the *dramatis personæ* of 'Phineas Finn' appear in the later novels of the series.

PHINEUS, fĭn'ẹ-ŭs or fī'nŭs, king of Salmydessus, Thrace, son of Agenor. He was a blind soothsayer and had received his prophetic powers from Apollo. Different traditions prevail concerning the cause of his blindness, but the one generally accepted is that it was a punishment inflicted upon him for his cruelty to the children of his first wife whom his second wife hated. He was tormented by harpies, who seized his food or rendered it unfit for use and was freed from them by Zetes and Calais, in gratitude for which service Phineus fitted out the Argonaut expedition.

PHINTIAS, fĭn'tĭ-ạs. See DAMON AND PHINTIAS.

PHIPPS, Henry, American manufacturer: b. Philadelphia, Pa., 27 Sept. 1839. He was engaged in various business houses of Pittsburgh, Pa., until 1861, when he became a member of the firm of Bidwell and Phipps, dealing in powder. Later he engaged in the steel industry in which he amassed an immense fortune. He is actively interested in various educational and philanthropic enterprises, has presented to the public several fine conservatories, established a completely equipped botanical garden in Schenley Park, Pittsburgh, in 1900, and in 1903 founded and endowed the Henry Phipps Institute (q.v.) at Philadelphia for the treatment of tuberculosis. He also built a psychiatric clinic in connection with Johns Hopkins Hospital, Baltimore.

PHIPPS INSTITUTE, The Henry, an institution in Philadelphia, Pa., founded by the generosity of Henry Phipps (q.v.) of Pittsburgh, Pa., for «the study, treatment and prevention of tuberculosis.» The institution was opened 1 Feb. 1903 and incorporated under the laws of the State of Pennsylvania, 1 Sept. 1903. The first medical director was Lawrence F. Flick. The first year there were in the house 52 beds, which were occupied all the time, and 2,000 patients were treated in the dispensary. Inspectors visited the homes of the outside patients to see that instructions were carried out. In 1903 the institute gave a series of international lectures which were largely attended. Great opportunities are furnished by the institute for research into the nature and best treatment of tuberculosis.

PHIPS, or PHIPPS, Sir William, American colonial governor: b. Pemaquid (now Bristol), Me., 2 Feb. 1651; d. London, England, 18 Feb. 1695. His youth was spent as a shepherd and as an apprentice to a ship-carpenter, after which he went to Boston, learned to read and write and then engaged as a trader. He married a rich Boston widow, built for himself a ship and engaged in commerce. Fired with the hope of regaining the treasure from a Spanish ship wrecked off the Bahamas, he went to England and prevailed upon the British Admiralty to furnish him a ship and means to seek the treasure. The expedition was unsuccessful but a second venture in 1667, backed by the Duke of Albemarle, resulted in the recovery of treasure to the value of £300,000, of which Phips' share was £16,000; he was also knighted and made sheriff of New England. In 1690 he commanded a fleet of eight vessels in an expedition against Port Royal which he captured, and later in the same year commanded an expedition against Quebec with a fleet of 34 vessels, but was unsuccessful and on the return voyage nine of his vessels were wrecked. He visited England endeavoring to induce the government to send another expedition against Quebec and while there, through the influence of Increase Mather (q.v.), was appointed first royal governor of Massachusetts. His first official act was the organization of a special court which speedily terminated the prosecutions for witchcraft. While governor he was accused of arbitrary measures and conduct, and in 1694 was summoned to London to answer complaints made against him. He received promises of restoration, but died in London before they could be carried out. Consult Cotton Mather's 'Magnalia' (1702); Francis Bowen's 'Life of Sir William Phips,' Vol. VII; Sparks' 'American Biography' (1834–37); Myrand, 'Sir William Phips dévant Quebec' (1893).

PHIZ. See Browne, Halbot Knight.

PHLEBITIS, inflammation of the veins. It may begin outside of the vein, from some wound, abscess, etc., from which irritant material travels upward in the loose connective tissue of the vein-bed. The inflammatory process invades the coats of the vessel, disturbing their nutrition and reaching the inner coat, where it causes cloudy swelling and roughness of the surface, on which the blood tends to coagulate in layers, and thus may form a clot large enough to block the vessel. Or the inflammation may begin from within the vessel, owing to a clot forming on its inner wall, and which, acting as an irritant, excites inflammation in the coats of the vessel from within outward. In the first case the formation of matter is likely to occur around the vessel, and parts of the clot, which is soft and loose, are apt to become detached and to be carried by the circulation to other parts, setting up similar changes there. In the second case the vessel is likely to be obliterated and converted into a fibrous cord. Death may result where a large vein is obstructed. The disease is indicated by great tenderness, tension, acute pain and a knotted, cord-like swelling in the course of a vein or veins, sometimes attended with discoloration of the surface. Dropsical swelling of the affected part or of a whole limb may occur.

Phlebitis may be prevented by proper care in the dressing of wounds, so as to keep the wound clean and healthy. The treatment is various. The patient must be kept perfectly quiet; the part be elevated; nourishing food should be given; tonics are of great advantage; stimulants are often required; and antiphlogistics locally applied will allay the inflammation. Abscesses within reach should be opened. Ligation of the part and washing out are also resorted to with success. See Phlegmasia.

PHLEBOLITE, a calcareous concretion formed within a vein. Such formations are due to the degeneration of coagulations in veins, or occasionally may have their origin in the coats of the vessels. Phlebolites which have formed nodules vary in size from that of a pinhead to that of a pea. They are also called vein-stones.

PHLEBOTOMY. See Venesection.

PHLEGETHON, flĕj'ĕ-thŏn, in Greek mythology, a name given to a river of fire in the infernal regions. See Cocytus.

PHLEGMASIA, a painful inflammation attended with considerable swelling, especially affecting the cellular tissue, such as phlegmasia glandulosa and phlegmasia myoica. Phlegmasia dolens (Phlegmasia alba dolens, white-leg milk-leg), the principal form, may affect both sexes. It has appeared in convalescence from typhoid fever and dysentery; in diseases of the rectum; as the result of the removal of fibroids and of the ovaries; but for the most part it is a disease of the puerperal state. It usually occurs in the left leg but both legs may be affected. As a disease of the puerperal state it is seldom seen nowadays, but when it so occurs it usually appears the second or third week after parturition. Premonitory symptoms are frequently absent, but there may be feverishness for a day or two. Pain, swelling and tenderness appear in the upper part of the thigh and extend downward and in 24 hours the whole leg may be swollen and hard and more or less tender, but not reddened. The leg is pale or sallow, has a glossy or polished appearance and is sometimes called marble-leg. Usually in a few days the pain and swelling diminish, but it is often several weeks before the disease disappears and sometimes the condition lasts indefinitely. After its disappearance persistent aching of the limb, œdema of the foot, muscular weakness, etc., may remain for a long time. The causes of phlegmasia dolens are periphlebitis, phlebitis and thrombosis. It commonly results from an extension through lympathic vessels of inflammation from and about the uterus to the tissues surrounding the great vessels of the thigh. The origin of the primary inflammation is not always ascertained, but it most frequently results from uterine infection (puerperal or contact infection) by pathogenic germs introduced by infected hands, instruments, etc., into the uterus. The treatment is both constitutional and local — sleep and rest in recumbent posture with the limb in a comfortable position and elevated; tonics and laxatives if necessary; easily digested food; hot anodyne fomentations; and when the disease disappears, careful bandaging, friction and favidization. A common complication is pulmonary embolism, in which case death supervenes in almost all cases.

PHLEGRÆAN (flĕg-rē′ạn) **PLAIN,** a volcanic plain on the Campanian coast west of Naples, Italy. Legendary lore locates this plain as the scene of the combat between the gods and the giants. Ruins of numerous Roman buildings are found here.

PHLEGYAS, flĕj′ĭ-ạs, in Greek mythology, king of the Lapithæ; he was son of Ares (Mars) and father of Ixion and Coronis; he is commemorated in the Hymni Homerici.

PHLEUM, a genus of grasses including timothy grass. See GRASSES IN THE UNITED STATES.

PHLOGISTON, flō-jĭs′tŏn, *in chemistry,* a hypothetical substance supposed at one time to be a part of all bodies that were capable of being burned. The conceptions of the terms element and combustion have been many and varied, but the first of real importance to the phlogiston theory was that of Becker (1635–82). He held that all inorganic substances were composed of three «earths,» the mercurial, the vitreous and the combustible called «terra pinguis,» and that when substances were burned or metals calcined (oxidized) this latter «earth» escaped. Stahl (1660–1734) expanded this idea into what was known as the Phlogiston Theory. This holds that all substances capable of burning — and calcination was recognized as slow combustion — contained a substance called phlogiston and that this was given off when the substance burned. A substance that burned readily contained a large amount of phlogiston; and as coal did so with the evolution of a large amount of heat and left little residue, it was supposed to be nearly pure phlogiston. A substance that had been burned could be rephlogisticated and thereby made capable of being burned again by being heated with a substance rich in phlogiston. Thus the result of the burning or calcination of a metal, known as a metallic calc, could be changed back to the metal by being heated with coal. This theory was generally accepted by chemists until toward the end of the 18th century. Phlogiston itself was never isolated, though the hydrogen discovered by Cavendish was thought by some to be this all-important substance. Facts began to accumulate, however, that seemed opposed to this theory. It was shown that metals gained instead of lost weight when calcined. Phlogisticians at first denied this, but later tried to explain it by claiming that phlogiston possessed negative weight, and that, therefore, a substance would, of course, be heavier when it had been driven off. Substances would not burn except in the presence of air. This was said to be because the air must be present to take up the phlogiston. The final overthrow of the theory was accomplished by Lavoisier. He showed and proved by careful weighings that a metal when calcined gained in weight and exactly as much as was taken from the air. Later, after the discovery of oxygen and its presence in the air by Scheele and Priestley, he showed that it was this oxygen that combined with a burning substance. Combustion was thus shown to be combination with oxygen rather than loss of phlogiston, and the phlogiston theory was abandoned. See COMBUSTION; LAVOISIER; PRIESTLEY; STAHL.

PHLOX, a genus of herbs of the family *Polemoniaceæ.* The species, of which about 30 have been described, are mostly tall, spreading perennials, and with two exceptions, a Siberian and a Chilean species, are all natives of North America, where they are extensively distributed. Their showy flowers, borne either in terminal clusters or solitary, and their ready adaptability to a wide range of soils and situations, have made phloxes general favorites in gardens. They are hardy and very floriferous and have developed a large number of hybrids and cross-varieties of great diversity of form, colors and markings. They are of two classes: the annuals, all the garden varieties of which have been derived from *P. drummondii,* a Texan species; and the perennials, derived from several species, some of which are still cultivated in the pure natural form in old gardens. Of these last one of the best known is the moss or ground pink (*P. subulata*), which is a favorite plant in rockeries and cemeteries, since it does well in dry soils and forms a dense mat of foliage and bloom. The cultivated perennial phloxes are, however, mostly derived from *P. maculata* and *P. paniculata.* The annual varieties are readily grown from seeds planted under glass or in the open air in spring, the seedlings being transplanted to good garden soil as soon as the weather becomes favorable. The perennial varieties may be propagated by seeds, but since these do not produce progeny like the parent, cuttings of stems or roots and division of the clumps are generally preferred. Division may be made in early spring or in autumn; stem-cuttings during the summer and root-cuttings in spring or fall. After they commence to grow, cutting plants are managed like seedlings. In the garden, the perennial sorts are planted three or four feet apart and divided every two or three years; the annuals are set a foot apart.

PHOBOS (Greek, «fear,» an attendant upon the god Mars), *in astronomy,* the inner satellite of the planet Mars. It was discovered at Washington, in 1877, by Asaph Hall. It is remarkable for its small size and for the rapidity with which it revolves about its primary. Its diameter is only about six miles, and its period of revolution is 7 hours, 39 minutes and 14 seconds. See DEIMOS.

PHOCA PHOCIDÆ, the genus and family of the typical seals. See SEALS.

PHOCÆA, fō-sē′ạ, ancient Ionian city in Asia Minor, situated on a peninsula between the gulfs of Elæa and Smyrna and on a neighboring island. Legend makes it a colony of Athens. It early attained great commercial importance, indeed the earliest Greek coins seem to be those of this city. Clay wares were its main export. Among its western colonies was Massilia, now Marseilles, and as early as the 6th century B.C. tribute was paid the city by native chiefs of southern Spain. But in 540 B.C., after a heroic defense the city was captured by Cyrus' lieutenant Harpagus; many of the inhabitants migrated to Corsica, where they successfully met the attacks of Carthaginians and Etruscans, and then to southern Italy, where they founded the city of Velia. A few of the Phocæans had rebuilt the city in the meantime; and in the Roman period it again grew to prominence and wealth. It was sacked by the Romans during the war with Antiochus; was attacked without success by Aristonicus of Pergamus; and then sank again into obscurity. The Genoese founded the city of New Phocæa near the site of the old in 1421.

PHOCAS, fō'kąs, Byzantine emperor: b. Asia Minor; d. Constantinople, October 610. He was of low birth and served in the army of Mauritius as an obscure centurion, where he gained a name for brutal courage among his fellows. In 602 he headed a revolt against Mauritius, seized the throne and after his coronation executed Mauritius and his five sons. Later accusing the Empress Constantina of conspiracy against him, she with her three daughters was cruelly put to death by his orders. He secured peace with Europe, but Chosroes II of Persia waged a determined war against him; and in 610 Heraclius, son of the exarch of Africa, led an expedition against him, invested Constantinople and put the tyrant to death with cruelty equal to that exercised by Phocas in his sanguinary reign.

PHOCAS, Column of, a monument in the Forum at Rome erected in 608 in honor of Phocas, emperor of the East. The column, 54 feet high, is of such artistic excellence that it is presumed that its workmanship must have been long before the 7th century. It was rediscovered in 1813.

PHOCION, fō'shĭ-ŏn, Athenian general: b. about 402 B.C.; d. Athens, 317 B.C. Of humble descent, he was educated under Plato and Xenocrates, receiving instruction which influenced his entire life. His first military service was performed under Chabrias, where he rendered good service in the victory at Naxos in 376 B.C. In 349 he was sent with troops to Eubœa, where he defeated the forces of Philip of Macedon, banished Plutarchus from Eretria and secured the island against the invasion of Philip. Later he defeated Philip's forces at Megara, re-established the walls of Nicæa, and on a subsequent expedition to Eubœa freed Orcus and Eretria from the Macedonian rule. In 340 he was sent to the Propontis, where he forced Philip to abandon the siege of Byzantium and Prienthus. As leader of the peace party at Athens he advised the surrender of Demosthenes and other orators demanded by Alexander after the destruction of Thebes in 335, but upon the refusal of the demand headed the second embassy and succeeded in appeasing Alexander. After the death of Alexander in 323 Phocion reluctantly assumed command of the forces which were to free Athens from the Macedonian sway. They were at first successful, but ultimately were compelled to make peace. Upon Antipater's death Phocion became involved in an intrigue with Cassander, rival of Polysperchon, and was compelled to flee to Phocis, whence he was delivered up to Polysperchon by the Athenians and by him forced to drink poison. The Athenians later repented of their injustice and buried Phocion with high honors. Consult Plutarch, ‹Life of Phocion.›

PHOCIS, fō'sĭs, an ancient division of central Greece and since 1899 a nome in the present kingdom. It lay to the north of the Gulf of Corinth; was largely taken up by the range of Parnassus, so that there were only a few fertile spots along the river valleys, especially the Cephissus, where excellent wines were grown; and gained most of its importance from the sacred city of Delphi (q.v.). The antiquity of settlements in Phocia is attested by the mention of the district and its most important cities in the Homeric catalogue of the ships in the second book of the Iliad. Myth makes the Leleges, Hyanthians and Thracians the first settlers, but the people in historic times were clearly of Dorian stock. The history of Phocis is little more than a series of quarrels over the oracle and treasure house at Delphi, of which the confederation of the 22 Phocian cities claimed to be guardian — a claim supported by Athens, always opposed by the Thebans and with less animus by the Thessalians (who were severely defeated at Hyampolis at the beginning of the 5th century B.C.), as well as the Spartans, against whom the Dorian Phocians joined Athens in the Peloponnesian War. The first Sacred War, 595–585 B.C., resulted in the destruction of Cirrha, a city which had lived by plundering pilgrims to Delphi. In the second Sacred War Phocis gained control of Delphi in spite of Sparta's intervention, but lost it again 30 years after by the terms of the Truce of Nicias (421). The third Sacred War began with a decree of the Amphictyonic Council of 357 B.C., no doubt dominated by Theban influence, condeming the Phocians to pay a heavy fine for having used part of the sacred lands of Delphi; and this decree was finally carried out in spite of the resistance of the Phocians, who were long secretly backed by both Athens and Sparta and who appropriated much of the Delphic treasure to carry on the war.

PHOCYLIDES, fō-sĭl'ĭ-dēz, Greek poet, who flourished about 537 B.C. His poetry was made up chiefly of gnomic precepts, and only 18 fragments have been preserved. A didactic poem in 230 hexameters long passed current as the work of Phocylides, but was shown by Jakob Bernays to be a later forgery. This seems to furnish evidence of the esteem in which Phocylides was held, the only object of the anonymous author having apparently been to procure prestige for his composition by attaching to it a recognized name.

PHŒBE, fē'bē, in Greek mythology, the daughter of Oranos and Gæa (heaven and earth), mother by Zeus of Asteria and Leto. As the successor of Themis and the predecessor of Apollo she presided over the oracle at Delphi. Later poets speak of Phœbe (the radiant one) as a title of Artemis, the moon goddess.

PHŒBE, The. See ESSEX, PHŒBE AND CHERUB.

PHŒBE-BIRD. See PEWEE.

PHŒBUS, fē'bŭs, **William,** American Methodist clergyman: b. Somerset County, Md., August 1754; d. New York, 9 Nov. 1831. He entered the ministry in 1783, and was engaged upon various circuits until 1798 when he established himself as a physician in New York. In 1806 he re-entered the ministry and continued in the service until 1824, when he was placed on the retired list. He edited the *Experienced Christian's Magazine* in 1796, and wrote ‹An Essay on the Doctrine and Order of the Evangelical Church of America as Constituted at Baltimore, 1784› (1817).

PHŒBUS. See Apollo.

PHŒNICIA, fē-nĭsh'ĭ-ạ, in ancient geography, a maritime region and a Semitic kingdom with widely varying boundaries at different periods, but generally defined as the fertile coast region of Syria lying between the Lebanon range and the Mediterranean, and bounded on the south by Carmel and on the north by Latakia (Laodicea) and the country around Cyprus. The name is Greek and has been variously explained; either from *phœnix*, «a palm tree,» or from *phœnix*, «red.» The former etymology would allude to the palms of the country; the latter to the red brown complexion of the inhabitants, or to the scarlet dye of the murex which was a staple article of trade with this people, or to the region about the Red Sea, whence their own legends say that they emigated. Very probably none of these explanations is correct. The native name was Khna, familiar to us in the form Canaan and signifying «the lowlands»; it was extended at an early date to cover Palestine. «Tyre and Sidon,» the names of the two great Phœnician cities, were often used to include all the cities of the plain. The coast line, 200 or more miles long and broken by several sharp promontories, is followed by a narrow strip of very fine sand; inland are the fertile plains of Acre, Tyre, Sidon, Marathus, etc., varied by round hills and backed by the range of Lebanon, 130 miles in length and overgrown with the proverbial cedars and other ship timber. Besides the great cities of Tyre and Sidon there were in early times even the minor cities of Arvad, Accho, Orthosia, Arka, Botrys, Berytus, Sarepta, Dora, etc., so that the entire country might have been defined as a series of ports practically forming one unbroken city along the sea. The geology of Phœnicia is simple with its silicious coast strip; its alluvial plains, cut by the rivers Badas (Nahr-el-Melk), Eleutherus, Orthosia (Nahr-el-Berid), Tripolis, (Kadisha), Adonis (Ibrahim), Lycus (Nahr-el-Kelb), Magoras (Beirut), Bostrenus (Nahr-el-Auly), Sidon, Litny, Sarepta (Zaherany) and Belus (Acre or Akko); and the mountain ranges of Bargylus and Lebanon, formed of an early limestone, very soft and broken now and again with igneous rocks. The sandstone is rich in iron in many localities; coal and ochre have been found and there is evidence that the Phœnicians themselves dug extensively for amber.

Commerce.—Almost as soon as they devoted themselves to farming and cattle raising in the plains and mining in the hills, the ancient Phœnicians must have begun to fish, to navigate the Mediterranean and to trade with its varied peoples. Whether they had been sailors before coming to the Mediterranean coast is uncertain; the question depends on the solution of the difficult problem of the precise origin of the people. Their own legend that they came from the region around the Red Sea would make it probable that they had known something of shipping and trade before they settled in their new home. At any rate in Phœnicia they were famous sailors and seem to have been the earliest people to dare to sail by night as well as by day, under the guidance of the north star, which they may be said to have discovered. The purple, or more exactly, scarlet dye made of the shell of the murex; the skilful embroidery, jewelry and weaving of the Tyrian craftsmen; and glass, which if not discovered by the Phœnicians was evidently improved and largely sold by them — together with the natural products of the country — were the main articles of Phœnician export. Imports were limited only by the variety of the products of the Mediterranean Basin, the Far West, for the Phœnicians brought tin from Britain and the Far East, for Syria and Babylonia made Phœnicia a market place for exchange with Egypt, and the caravan wares of India and eastern Africa both made their way to Phœnician marts, where there was a great slave trade.

Colonization.— Phœnician colonists were no less famed than their traders and navigators. The impulse seems to have been due to the wars in Canaan, which drove the Hitites and Amorites into the northern and maritime country whence they were sent to settle in Cyprus. It seems probable that by 1500 B.C the Phœnicians had colonies throughout the Ægean Sea. Soon afterward, at the latest, they settled in Malta, Sardinia and Sicily, where the cities of Motye, Soloeis and Machanath (later Panormus) grew up; then Hippo, Ityke (Utica) and Carthage were planted on the African coast, Carthage becoming one of the greatest maritime powers of the Old World, and about 1100 they reached the Pillars of Melkarth (or Hercules), now Gibraltar, and founded Gades (Cadiz), a western outpost and a trading station with the countries of the nearer Atlantic.

History.— The ethnology and early history of the people are alike uncertain. The Biblical account (Gen. x, 6–15) in making Sidon a descendant of Ham seems to argue for the Hamitic origin of the race. The argument against this from the Semitic character of the language is not conclusive; as in Parthia, a Turanian people adopted an Iranian language and became merged to a great degree with the Persians as concerns customs and religion, so here it is possible at least that the Phœnicians may have been originally Hamitic and that they learned a Semitic tongue only after their settling in the eastern end of the Mediterranean. But, taking into consideration the racial type and the mental characteristics of the people, most ethnologists are agreed on their Semitic origin. Relationship with Egypt then becomes merely a matter of commerce and trade. The earliest historical mention of the country is in Egyptian monuments and evidences Egyptian control of the Phœnician cities from 1600 to 1300 B.C. Sidon then arose as a great power, withstood the Israelites and made Dan subject to her, but was unsuccessful in her attack on the Philistine city of Ascalon, which, attacking her in turn, practically broke the supremacy of Sidon. Tyre was the new leader, its supremacy beginning about the middle of the 13th century B.C., colonization being extended and the cordial feeling with the Israelites rising to its highest in the days of Hiram and Solomon. But Tyrian hegemony after 400 years nearly (1250–875) was broken by the Assyrian Empire, whose control of Phœnicia lasted, with important intervals of successful rebellion on the part of Tyre, to the last of the 7th century (about 625). Egypt first, then Babylon, now held all Syria; and after Cyrus' capture of Babylon (538 B.C) Phœnicia was a part of the Persian Empire up to 333. In this period much of the old maritime power of Phœnicia returned; she became in short the Persian naval outpost on the Mediterranean. This power prompted a revolt against Persia, which founded a brief period of independence before the capture of Tyre, after one of the greatest sieges in history, by Alexander the Great in 332 B.C., which closes the history of the region. Syria fell under Turkish rule in 1516.

Religion.— The precise nature of the Phœnician religion is as obscure as all Phœnician origins. Philo of Byblus (about 64–141 A.D.), himself a Phœnician, wrote in Greek on this topic in a manner that some critics consider mere euphemistic theorizing, but which others accept as actual proof that the gods were merely notable heroes of the primitive period. It seems more probable that, like most other Semitic religions, the Phœnician was a nature worship, possibly monotheistic in origin, but certainly polytheistic and extremely corrupt, vicious and depraved in historic times. Indeed almost all that is unnatural and vile in Greek cults seems traceable, at the expense of less or more ingenuity, to Phœnician influence. The wickedness of Sodom and Gomorrah and the cities of the plain was proverbial in both the Old and New Testaments; it seems to have been ceremonial and closely connected with the worship of Ashtoreth (Astarte, the *Venus Syriaca*), and not to have been due to the ill-repute that the Phœnicians had for veracity, fidelity and honesty. The word "sodomy," from Sodom or Sidon, is in itself a sufficient commentary on Phœnician worship. Ashtoreth, on the naturalistic theory, seems to be the personification of the moon, as Baal was the sun. Melkarth, the tutelary deity of Tyre, in many respects like the Hellenic Heracles, whose very name indeed has been derived from Melkarth (read backward, as the Phœnicians wrote from right to left); Adonis, or Adonai, the god of Byblus, the complaint for whose loss seems to have fashioned a ceremonial elegy, which possibly affected the Ionian elegiac form, and whose name was substituted by the Hebrews for the sacred triliteral name of Yahweh (IOA) in their texts; and Dagon, the fish-god, are a few of the divinities which sprang up after the early monotheistic stage in which Baal alone was worshipped. Human sacrifice was practised, notably to Moloch, as we know from the Scripture narrative; and it has been suggested that prostitution as a cult rite may have had its origin in the same notion of averting the divine anger by offering up the most precious and best — an idea carried even further by the emasculated Galli. In the Phœnician temples no statues of the gods were reared, but simple cone-shaped columns.

Art and Architecture.— See article PHŒNICIAN ART.

Language and Literature.— The Phœnician alphabet was the original, thanks to Sidonian and Tyrian colonies which carried it through the Mediterranean, of that of the Greeks, who reckoned Cadmus, a Phœnician, the inventor of letters. It is certain that there were earlier alphabets, for example, Egyptian and Hittite; and it seems probable that the Phœnician was derived from the Egyptian. If so it has the virtue of simplification as it contains only 24 letters, practically those of the earlier Greek alphabet with the sign F, for a *v*, *w*, or *f* sound. The importance of this simplified alphabet, the direct ancestor of the Greek, and thus indirectly the parent of all the alphabets of modern Europe, can scarcely be overestimated. The language of the Phœnicians differed so little from Hebrew that a Hebrew scholar has little difficulty in reading it. Like the alphabet it was spread widely over the Mediterranean Basin by colonization, but as the Phœnician colonies were overwhelmed by Greece and Rome the language died out; Carthage, destroyed by Rome in 146 B.C., was probably the last place where the language was used. The result is that the greater part of our knowledge of the language is from very indirect sources such as proper names of gods, men and places, or chance citations in grammatical writings. The direct sources include only the inscriptions on coins or temple walls, votive offerings, etc. These are included in the French Academy's 'Corpus Inscriptionum Semiticarum' (1881 seq.), and their grammar is dealt with in Schröder, 'Die phönizische Sprache' (1869) and Lidzbarski, 'Handbuch der nordsemitischen Epigraphik'; they date from the 9th century B.C. to the 3d century A.D., most being between the 5th and the 2d centuries B.C. The nature of the inscriptions, their brief ceremonial form, make the Phœnician vocabulary which has come down to us consist very largely of names of divinities, the names of men and women being almost without exception compounded of god-names; and the indirect sources, as has been remarked, furnish nothing but proper names. These indirect sources are the Biblical texts, citations by Greek and Roman grammarians, and such names, preserving their Phœnician form somewhat, as occur in Greek and Latin translations of Phœnician authors. How large a literature there was in Phœnicia proper and its colonies is problematic. The work of Sanchuniathon of Berytus on cosmogony and theogony, supposed to date from 1200 B.C., is preserved in part in a Greek version by Philo of Byblus, who is reckoned by some modern scholars to have tampered with the original if original there ever was. Other names are those of the historians Theodotus and Hypsieratus (whose clearly Greek names cast suspicion on their being actually Phœnicians), Mochus, who is said to have enunciated the atomic theory; and among African authors, Hanno, whose 'Periplus' in Greek version has come down to us, and Hiempsal, king of Numidia, Hamilcar and Mago, who all wrote on history and agriculture. Mago's work was translated into Latin by Silanus upon the order of the Roman Senate, and seems to have been used in Varro's 'De Re Rustica' and in Virgil's 'Georgics.' Virgil's description of the song of Iopas at the close of the first Æneid may prove that he knew something of Punic philosophy; Servius states that this was the case, but it is quite as likely that the outline of the theogony of Iopas is reminiscent of Sanchuniathon, or from some other Hellenic source.

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PHŒNICIAN ART. The Phœnicians invented little in the domain of art; what remains of their production shows them to have been possessed of the power of assimilation and recombination so as to be able to improve upon models which they derived mainly from Babylonia, Egypt and Assyria. What they produced bore the impress of the most skilful workmen of ancient times and in their developed forms often returned to the countries whence they had sprung. Figures, identified as Phœnicians, on the walls of Rekhmara's Tomb at Thebes, erected in the time of Thotmes III, wear richly embroidered tunics and carry vases in their hands, from which may be inferred the skill already developed in embroidery and pottery-making.

It will be more logical, however, to speak first of Phœnician architecture. Few remains exist of which anything like an adequate account may be derived. The reason is two-fold; first, the temples, built of stone, were of monolithic or megalolithic structure, and disappeared, for the most part, during the succeeding supremacy of the Cananites, who used the material for their own more refined building. The domestic architecture was of wood and metal and has long since crumbled away. Enough remains, however, to enable us to form a basis for reconstructing the system upon which they worked. Contrary to the system of the Greeks, as pointed out by M. Renan, the foundation of Phœnician architecture was the carved rock and not the column. When the wall replaced the carved rock the character of the latter was not wholly lost. The keyed vault was probably unknown to them. Neither did the Phœnicians construct each architectural member out of separate stones, as was demanded by Greek taste; but instead they frequently carved as many as three or four members out of a single block of stone. The refinement of design, which results from the lines of the stone following the lines of the building, was wholly absent. Whatever the size of the block in leaving the quarry, it did not diminish in being incorporated into the building.

The existing monuments are chiefly to be found in the neighborhood of the five coast-towns,— Ruad (Aradus); Amrith (Marathus); Jebeil (Byblus); Saida (Sidon); and Sur (Tyre). At Amrith is a temple or shrine in good preservation. It stands in the centre of a rectangular area, 192 feet long by 160 broad, its foundation is block 20 feet square and 10 feet high, of living rock, showing the depth to which the surrounding area was sunk. The superstructure consists of three wall blocks covered by a roof of a single block, enclosing the interior on three sides only. No ornament is attempted save a fillet, and cornice around the exterior of the roof-block, and a shallow carved vaulted roof on the interior. No steps lead up to the fane. A similar fane, discovered in the neighborhood by Renan during the Syrian expedition projected by Napoleon III, though not so well preserved, bears evidences of an entirely monolithic structure.

The walls of Phœnician towns were of massive stones like the foundations of temples. These were placed in superimposed courses without the use of mortar. Of all Phœnician monuments, the tombs, or structures supposedly tombs, of which there are several remaining in good preservation possess the highest architectural character. The best known are the "Maghazils" near Amrith, one of which Renan has called "a real masterpiece in respect of proportion, elegance, and majesty." This monument consists of three parts; the basement story being circular upon a square platform or plinth. Above each corner of the plinth stands an engaged lion. The second story is cylindrical, of less diameter than the base, and has a molding of delicate curve at its base and carved dentals and battlements around the upper part. The surmounting story is cylindrical, of still less diameter, crowned by similar carving and finished by a dome. The basement story consists of four blocks, while all above it is monolithic. The type of monument, though rare, may be original with the Phœnicians, as it differs from the pyramidal and the step-terraced terminations of Egyptian and Assyrian monuments.

The four lions upon the tomb are among the most important of the remains of Phœnician sculpture. They are rudely carved and bear some indications of a Mesopotamian conception of animal life, with a peculiarity of technique that allies them with the bas-reliefs or empæstic metal work by which Phœnician sculpture was almost exclusively represented. Reliefs cut in solid rock at Gineh and Mashnaka of animals and men are comparable to Assyrian sculpture, but represent humbler phases of life than that depicted upon the works of Nineveh. Movable sculpture showing Egyptian characteristics, and sarcophagi with bas-reliefs of confused Egyptian and Greek elements have been found at Saisa. Their date is assigned to a time not earlier than the Seleucidæ.

The lack of sculptured remains is due to the fact that the Phœnicians probably made their movable figures out of metal. Upon a wooden core carved either in relief or in the round, the metal was placed and hammered to fit the carvings beneath, forming a so-called sphyrelaton. Bronze was the metal usually employed for ornamented vessels. Reliefs were made of copper, gold, silver and even tin; these metals being sometimes employed in connection with mosaics of precious stone, ivory and amber. The elaborately ornamented pillars, called Jachin and Boaz in Solomon's temple, the altar of gold, and the table for the show-bread, the great laver supported by lions, together with vessels, lamps, candlesticks and all implements described in 1st Kings in the Old Testament as appurtenances to the temple, were of Phœnician workmanship. The bronze dishes embossed and engraved, found by Sir Austin Layard at Nimrud and described in his 'Monuments of Nineveh,' are ascribed to Phœnician workmen of the 8th or 9th centuries B.C. The designs upon these vessels show more liveliness of fancy than artistic merit. Figures of men as well as various animals natural and mythological, including the sphinx derived from Egypt, are wrought upon them. The human figures are often purposely grotesque.

In gem-cutting the Phœnicians attained a degree of excellence, while in many of the other minor arts such as ornamental jewelry, embroidery, etc., evidences of their variety and skill are not wanting. Consult Clermont-Ganneau, C., ‘L'Imagerie phénicienne’ (Paris 1880); Fröhner, C. E. L. W., ‘La verrerie antique’ (Le Pecq 1879); Halbherr, O., ‘L'antrodi zeus in Creta’ (Rome 1883); Menant, J., ‘La glytique orientale’ (Paris 1883); Perrot and Chipiez, ‘History of Art in Phœnicia and its Dependencies’ (2 vols., trans. by W. Armstrong, New York 1885); Rawlinson, H. C., ‘History of Phœnicia’ (London 1889); Renan, E., ‘Mission de Phenicie’ (Paris 1865–74).

PHŒNISSÆ, fē-nis'sē, a play of Euripides (q.v.). It receives its name from its chorus of Phœnician captives. The story of the play is the same as that of the ‘Seven Against Thebes.’ The maidens who form the chorus are supposed to be on their way from Tyre to Delphi where they were to serve in the temple, but on the outbreak of the war were detained at Thebes.

PHŒNIX, fē'niks, Ala., a city of Lee County, opposite Columbus, Ga., 76 miles northeast of Montgomery and situated on the Central of Georgia Railroad. It was founded just before the war, was incorporated in 1883, received a new charter in 1894, under which it is now governed by a mayor elected biennially and a city council. It is a city of homes with growing commercial interests. Pop. 4,555.

PHŒNIX, Ariz., city, capital of the State and county-seat of Maricopa County, on the Santa Fé, Prescott and Phœnix Railroad, in the south central part of the State. A short railroad line connects Tempe, on the Santa Fé, eight miles east of Phœnix, with Maricopa, on the Southern Pacific Railroad. It was settled in 1870 and in 1881 was incorporated. It is in a mining region, where there is good farm land in the valleys. The chief industrial establishments are stock-yards, machine shops and large jobbing houses. It is a famous winter resort. Its trade is chiefly in fruits, especially oranges, honey, grain, wine, mining products and live-stock. The prominent public buildings are the capitol, the agricultural experiment station, insane asylum, courthouse, city-hall, new Young Men's Christian Association building, Water Users' building, Federal building, churches and schools. The public school system has been developed with great intelligence, both in regard to school buildings and courses of instruction. The city has six large modern grammar schools and the High School group presents a most attractive appearance. Other educational institutions are Academy of the Sacred Heart, Saint John's Indian School (R.C.), a number of parish schools and a public library. The government is administered under the commission managerial form, put into effect May 1914. The officers are a mayor and four commissioners. The city's business is managed by a «city manager.» Pop. about 25,000.

PHŒNIX, fabulous bird, about the size of an eagle. According to Herodotus it came from Arabia once every 500 years to the sanctuary dedicated to it at Heliopolis, bringing with it the dead body of its parent, which it buried in the shrine. When it felt its life drawing to a close it built itself a nest, from which after its death a new phœnix rose; while other versions speak of a worm which, proceeding from the body of the dead bird, was developed into a new phœnix. According to a more modern modification of the story the bird, at the age of 500 years, built a funeral pile of wood and aromatic gums, which it lighted with the fanning of its wings, and rose from the flames with renewed life. Similar stories of birds occur in the Oriental mythologies, as, for instance, the myth of the Persian bird *simorg* and that of the Indian *semendar*. Ancient writers mention four epochs of its appearance in Egypt under Sesostris, under Amasis (569–525 B.C.), under Ptolemy III (247–221 B.C.), and under Tiberius (34 A.D.). In Saint Clement's epistle to the Corinthians it is used as an illustration of the doctrine of the resurrection; it had been regarded by the Egyptians as the symbol of immortality thousands of years previously; it appears on the coins of several Roman emperors as a symbol of their own apotheosis or of the dawn of a more glorious era under their reign.

PHŒNIX, *in botany*, a genus of palms, containing such valuable species as the date-palm, sago-palm and others of northern Africa and southern Asia. See DATE-PALM; PALMS.

PHŒNIX OF THE HOUSE OF HOHENLOHE, Order of. See ORDERS, ROYAL.

PHŒNIX PARK, in Dublin, Ireland. On 6 May 1882 Lord Frederick Cavendish, Chief Secretary of Ireland, and Thomas Burke, the under secretary, were assassinated in this park. See DUBLIN.

PHŒNIXVILLE, fē'niks-vĭl, Pa., borough, Chester County, at the junction of the Schuylkill River and French Creek, on the Pennsylvania and the Philadelphia and Reading railroads, 23 miles northwest of Philadelphia. It was first settled in 1792, and the borough incorporated in 1849. It is an important centre of the iron industry, and contains rolling mills, blast furnaces, bridge works and steel mills. It also manufactures cotton goods, hosiery, silk and matches. The borough has a public park, a hospital, a public library and good schools. The government is by a council and a burgess who holds office for three years; the public school directors are chosen directly by the people. The waterworks are owned and controlled by the borough. Pop. 10,743.

PHOLAS. See DATE-SHELL.

PHOLUS, fō'lŭs, in the Greek myth, a centaur of the Pholœ, a spur of the Erymanthus range, which separated Elis from Arcadia. When Hercules visited him he opened in his honor a cask of wine, the gift of Dionysus, and the other centaurs who had joined in the revel becoming excited with the fumes of the wine fell upon Hercules with sticks and stones. Hercules fought his way out of the cave and slew many of them with his poisoned arrows, putting the rest to flight. Pholus was accidentally wounded by one of the poisoned arrows from which he died.

PHONAUTAUGRAPH. See PHONOGRAPH.

PHONENDOSCOPE, an instrument used in auscultation in much the same manner as the stethoscope, than which it is much more delicate. It consists of a shallow cup from which project rubber tubes covered with a disc of ebonite. In the centre of the disc is a small rod carrying a button on its end. The button is placed on the area under examination and the tubes are fitted to the ears of the examining physician.

PHONETIC SPELLING, a system of spelling in which the words are spelled exactly as they are pronounced, the sounds being represented by characters, each of which represents a single sound; as «stix» for sticks.

PHONETIC WRITING, is writing according to sound, the ordinary method of the stenographer. There is a more primary meaning to the phrase, referring to the rendering of languages or dialects not yet reduced to written form. For instance, a traveler reporting on native words in a little-known savage tongue, has to reproduce them phonetically, as they sound to him. This custom has resulted in a great duplication of spellings, as Hindoo and Hindu, and geographers and editors of gazeteers have had infinite trouble in trying to reduce them to reasonable system. L'Association International Phonetique has been formed as an authority to remedy many of the difficulties encountered by editors and stenographers in dealing with phonetic renderings. The re-spelling of title words in dictionaries and encyclopedias is done phonetically, and there is an unfortunate lack of harmony in the method of using diacritical marks to indicate the exact pronunciation. See ORTHOGRAPHY; STENOGRAPHY; SPELLING REFORM.

PHONETICS, or science of speech-sounds, is the art of producing speech-sounds and recognizing them by the ear. The organic side of phonetics describes the actions and positions of the vocal organs — throat, tongue, lips, etc.— by which speech-sounds are produced, and classifies those sounds according to their organic formation. The *acoustic* study of speech-sounds classifies them according to their similarity to the ear and explains how the acoustic effect of each sound is the necessary result of its organic formation. In common practice phonetics apply to the articulate sounds of human speech and their representation by alphabetic characters. How unsatisfactory and misleading the alphabetic system is — in the English language especially — may be shown by the similarity of spelling (ough) and the total dissimilarity of pronunciation in such words as *cough, rough, bough, though* and *through,* while *rite, write, right* and *wright* are all pronounced the same. The foundation of speech is the current of air issuing from the lungs through the bronchial tubes into the trachea and thence into the larynx, across the interior of which are stretched the *vocal cords* — two elastic ligaments. The breath causes these cords to vibrate and produce a musical sound — the *voice,* from which is obtained an endless variety of sounds, vowel and consonantal. The lungs are the bellows of the speaking machine; the larynx is the vocalizing part where the modifications affecting the pitch of the voice are produced; the contraction and expansion of the vocal ligaments or glottis — the orifice of the larynx — produce the sound or voice and regulate its volume between the loud and the whisper. The pharynx, or passage between the larynx and the mouth, is a cavity susceptible of various degrees of contraction and expansion, from which the percussive effects of consonants mainly arise. In passing through the mouth the sounds receive their final shade and texture by the operation of the tongue against the palatal arch; the valvular action of the soft palate and the formation of the lips. The physiology of speech is a complex study, absolutely indispensable to an understanding of phonetics. The researches of American, British, French and German philologists have led to the construction of an alphabet by which every sound that the human voice is capable of uttering can be expressed by one invariable symbol. After many years of experiment, a «Universal Alphabet» was published by Prof. Alexander M. Bell of London in 1867 under the name of «Visible Speech,» applicable to every language. It contained no «letters» in the alphabetic sense; each symbol represented an operation of the organs of speech; by following each sign the reader must inevitably produce the correct sound, whether labial, dental, sibilant, guttural or any *nuance* of a vowel sound. Applied to any other language, it removed the impossibility of reproducing foreign sounds by the somewhat clumsy system of «transliteration.» In effect it was the same theory as obtains in music, where 10 musicians of different nationalities and unable to converse with each other may nevertheless perform harmoniously together in the same orchestra.

The English alphabet is the alphabet of Latin, and for that reason it is inadequate for representation of the very many vocalizations of English which are alien to Latin, for example, the several different values of the vowels. The five vowels have in Latin each two values and no more; they each represent one vowel sound long (or full) and short (or thin, *tenuis*). But the vowel signs in English stand each for several different sounds. For example, *a* stands for the several vowel sounds heard in fate, fat, father, fall, fare, what and in the initial syllable of among; *e* has at least six values, as in we, wet, here, her, there and the final syllable of gotten; *i* represents seven different sounds; *o* represents eight and *u* four. Or the sound of *a* in lane may be represented in other words by *ei* (rein) or by *ea* (great).

The several consonants, too, are not restricted to one sound-value: examples, get, gem; cat, cent. Consonant sounds unknown to the Latins are represented by combinations of consonants: *ch,* as in chin and as in chivalry; *th* as in thin and in than. Then, both vowels and consonants are in a large proportion of the words of the language silent. A phonetic alphabet would, as far as is possible, provide a sign for each vocalization in the language and would eliminate «silent» letters. Many alphabetic schemes to that end have been proposed, perhaps the most notable among them being the phonetic alphabet devised by A. J. Ellis of Cambridge University and Isaac Pitman, which was first published in 1847, and which since that time has been variously modified by them or by others. Though strenuous efforts have been made for the adoption of the Ellis-Pitman or other similar phonetic systems; though primers and textbooks for schools and works of general literature, including the Bible and numerous magazines and newspapers, have been printed in phonotype, and alphabetic reform has been zealously and ably advocated in England and the United States, there is as little prospect now of its adoption as there was 70 years ago or even less.

In the phonetic alphabet of Ellis and Pitman, as at first constructed, 23 of the letters of the Latin alphabet were retained, the remaining three, *c, q* and *x* being rejected as superfluous. Seventeen new characters were devised to represent sounds that are not represented unambiguously in the existing alphabet. Afterward the 17 new characters were reduced to 11, namely, 7 new signs for vowel sounds and 4 for consonants. In a phonetic alphabet the signs must always, in whatever position, each represent one definite sound-value and no more. The sounds represented in such an alphabet by the vowel signs *a, e, i, o* and *u* are the sounds which those vowels have in the words, an, ell, in, on, run.

In 1877 the American Philological Association agreed upon an alphabet, the distinguishing features of which were the use of the five vowel signs in their Latin values, and the addition of three new forms, making eight vowel symbols. By placing a macron over these the long vowel was represented; unaccented, the vowels were short. With the further development of the science of phonetics and a consequent change in the methods and aims of language study, a growing need was recognized for a rational scientific alphabet. In 1903 a committee was formed of five members representing the National Education Association, the American Philological Association„ and the Modern Language Association of America, to «agree upon and promote the general adoption of the best set of alphabetic symbols to be used in dictionaries and text-books for the accurate denotation of the sounds heard in English speech.» The alphabet of 1877 was adopted as the basis for the proposal. The result of the committee's labors was issued in 1904 and is generally known as the «N. E. A. Alphabet.» Briefly stated, it consists of 45 symbols — 18 vowel sounds, 24 consonants and three diphthongs, as being sufficiently precise for popular scientific purposes. By dropping the signs that can be most easily dispensed with in rapid writing, a «shorter alphabet» of 38 letters was arrived at.

The consonant signs in the phonetic alphabet stand for the same vocalizations which they represent in the regular alphabet, with this exception, that in the phonetic system they have only one sound: *g* is always hard, as in get, never soft as in gem, the soft sound of *g* being there represented always by *j;* in like manner *s* is always sharp, as in so, never soft as in has: the sound of *s* in has is represented phonetically by the character *z*. The sounds of *sh, zh, th* and *ng* as heard in she and nation, in leisure and occasion, in thin, in thou and in sing, have in the phonetic alphabet their proper signs, as can be seen in numerous examples of phonotypy.

The modification of the vowel signs make them representative of vowel sounds not adequately discriminated in the existing alphabet. There the vowel sound of *o* in more, of *u* in puzzle, of *u* in delusion, of *u* in confuse and various other vowel sounds not discriminated in the regular alphabet; also the sound of *ng*, of *sion* in delusion, of *th* in truth and a number of other vocalizations of English speech, are represented unambiguously in the phonetic characters. Lord Lytton wrote: «A more lying, puzzle-headed, delusion than that by which we confuse the clear instincts of truth in our accursed system of spelling was never concocted by the father of falsehood. How can a system of education, flourish that begins by so monstrous a falsehood, which the sense of hearing suffices to contradict?»

Although the alphabetic system and orthography of the English language are notoriously chaotic, the very magnitude of the evil constitutes an insuperable obstacle to reformation. To adopt any radical phonetic system would at once antiquate all the existing literature in our language. The inconsistent orthography to which we adhere would surprise a generation that had been accustomed to a rational system; and the «ancient classics» of the year 1918 would be as irksome reading as the writings of Chaucer and Wyclif are now. The new generation would have to learn the old A, B, C and the old orthography, else those «classics» would be unintelligible to them. On the other hand the opponents of reform maintain that an educated person finds no difficulty in spelling correctly, whereas a less educated individual would probably have quite as much trouble even if the orthography were simplified. Reading is the best teacher. See LANGUAGE, SCIENCE OF.

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PHONOGRAPH, an instrument invented in 1877 by Thomas A. Edison (q.v.) of Menlo Park, N. J., by means of which within a moderate radius sounds can be registered permanently and afterward reproduced from such mechanical register. The instrument as originally made consists of a mouth-piece, having a diaphragm or membrane. Connected with the centre of this diaphragm is a steel point, which when the sounds are projected on the diaphragm through the mouth-piece vibrates and cuts a vibrating spiral groove in the surface of a rotating cylinder having also a slow endwise motion. This cylinder surface is then hardened and becomes a «record» for reproduction of the sounds. In the original phonograph a piece of tin-foil is laid round the cylinder, being kept close to it by means of gum or water, and the stand holding the mouth-piece is brought close to one end of the cylinder; the steel point of the diaphragm is then adjusted so as to be just touching or close to the tin-foil, and above the line of spiral groove. It will be seen, then, that any movement of the steel point due to the motion of the diaphragm will cause a slight indentation of the tin-foil, which will by such movement be slightly depressed into the groove beneath it; and if the cylinder be rotated, that the steel point will, from the pitch of the groove and screw being alike, always be over the line of groove. If the instrument be then set as above described, and some words be spoken into the mouth-piece, while at the same time the cylinder is kept in rotation, a series of minute marks are made upon the tin-foil by the movements of the steel point, and these markings have all an individuality of their own, due to the varying sounds addressed to the mouth-piece. So far a *register* only of the sounds emitted has been obtained, and we have now to show how these sounds in this manner, fixed as it were on the tin-foil, can be reproduced. To effect this the mouth-piece must be drawn back and the cylinder rotated in the reverse direction to what it was at first, so as to bring the same part of the tin-foil with which the operation commenced back to the point at which it started, namely, opposite the steel point. The diaphragm with its steel point is then approached toward the tin-foil as at first and is now resting upon the same point of the tin-foil as it had previously first indented. The cylinder is now rotated as at first, with the result that the small indentations or sound markings made previously now act upon the steel point by causing it to rise or fall or otherwise move as the markings pass beneath it; the result of this is that the diaphragm in connection with the steel point is thrown into a state of vibration exactly corresponding to the movements induced by the forms of the markings and thus affects the air around so as to produce sounds, and these vibrations being exactly similar to those originally made by the voice necessarily reproduces these sounds to the ear as the words at first spoken. The diaphragm in this way acts as the medium of transmission of sounds to be registered on the tin-foil, and as the medium of reproduction of these sounds from the metallic register on which they have been impressed.

In Edison's improved phonograph (1895) tubes of wax are used instead of the tin-foil, the cylinder fitting into the inside of the tube, and the markings being made on the surface of the wax by a fine steel point. This familiar type of phonograph has a horizontal mandrel or shaft, on which the cylinder turns by the pressure of a spring, which is usually wound by a hand crank. The hollow cylinder record is slipped on the cylinder which is uncovered at one end for that purpose. The diaphragm or reproducer, which holds the horn, travels along the cylinder, following the spiral indentations of the record. The wax cylinders can be used several hundred times, the machine being fitted with a small paring tool which will shave off the record previously made leaving a smooth new surface. The machine has also been supplemented by the inventor with an ingenious little electric motor with delicate governing mechanism, so that the phonograph can be operated at any chosen rate of speed, uniformly. This motor derives its energizing current either from a storage battery or an electric-light circuit.

The cumbersomeness of phonograph cylinder records, which required great room for storage, led to the marketing in 1897 of machines in which a disc carried the record, those being frequently called gramophones or graphophones (q.v.). The discs had the advantage of permitting longer records. A prominent machine of this type is the Victrola. In the disc machines, a turntable replaces the cylinder, and this turntable supports and rotates the disc record, which is clamped fast. A needle of steel, wood, etc., is used to travel in the indentation and impart the vibrations to the diaphragm in the sound-box. The Dictaphone is another development, also the Detectograph, all of which employ the fundamental principles described. The greatest demand has proved to be for records of popular songs and instrumental music. Automatic phonographs are to be found in many places of public resort, equipped with musical or elocutionary cylinders, which can be heard upon the insertion of a small coin; and miniature phonographs have been applied to dolls and toys. The value of the phonograph in the preservation of dying languages has been perceived, too, and records have already been secured of the speech, songs, war-cries and folklore of American tribes now becoming extinct. It is also worthy of note that several voice records remain of distinguished men who «being dead yet speak.» Their tones can now be renewed at will and their very uterances, faithful in accent and individuality, can be heard again and again through all time.

The manufacture of phonographs and graphophones has become an industry of some importance in the United States. The production in 1899 was valued at $1,240,000; rose to $5,438,000 in 1909 and to $11,525,000 in 1914. The production of records and blanks is about $5,000,000 annually. There has been much increase in the quality and the value of the individual machines, also in the size and quality of the musical records, especially the discs. In 1914 there were 18 establishments engaged in the industry, employing about 10,000 persons and capitalized at almost $34,000,000.

PHONOGRAPHY. See SHORTHAND.

PHONOLITE (Clinkstone), *in geology,* a compact gray or green volcanic rock of feldspathic or porphyritic texture consisting largely of orthoclase, nepheline, pyroxene and sometimes leucite. Found in the United States principally as dikes in the Black Hill region and in the Cripple Creek mining district. More widely distributed in Europe, being found in many parts of Germany and in the volcanic region of central France. Also found in the Cape Verde Islands. Many phonolites crack up internally into a number of parallel plates so that the stone gives a peculiar sound when struck with a hammer, hence the name.

PHONOMETER, an instrument, usually self-registering, for ascertaining the number of vibrations of a given sound in a given space of time.

PHONOSCOPE, an apparatus for testing the quality of musical strings, invented by Koenig. Also a combination of an induction coil and battery with a rotating vacuum tube, for translating vibrations of sound into visible figures.

PHORBAS, fôr'bạs, in the Greek myth, a son of Lapithes, father of Augea and Aktor. He was asked by the Rhodians for his assistance in freeing their island from serpents, and for his services was honored as a hero. Many identify him with the constellation Ophiuchus.

PHORCYS, fôr'sĭs, **PHORCYN,** or **PHORCUS,** an aged sea god, according to Homer; according to Hesiod a son of Pontus and Gæa (sea and land). He was brother of Nereus and Ceto, of whom he begot the Graiæ and the Gorgons, and the dragon Ladon that watched over the golden fruit of the Hesperides. He is also called the father of the nymph Thoosa, who was the mother of Cyclops Polyphemus, the maidens Hesperides, the Sirens and Scylla.

PHORMINX, an ancient Grecian lute or lyre.

PHORMIO, fôr'mĭ-ō, a comedy by Terence, produced in 161 B.C. It was copied from a comedy of Apollodorus and in turn copied by Molière in ‘Fourberies de Scapin.’

PHORMIUM. A silky fibre obtained from a plant (*Phormium tenax*) found in New Zealand, the Chatham Islands and Norfolk Island. It was introduced in 1789 in Great Britain and continental Europe. It grows abundantly in the southern part of Ireland and also on the west coast of Scotland. The plant receives its name of «Phormium» from the Greek φορμός, a basket, because of the use made of its leaves by the people of New Zealand. The leaves are «thick, stiff and leathery,» and the flowers bright red or yellow and from one to two inches long. It grows best along streams. Among the Maoris the fibre is used for cloaks, mats, fishing-lines, etc. Phormium is prepared very carefully by the natives, but the process is very wasteful. After its importance had been recognized machinery was invented to free the fibre from the leaves. As this means, however, produced an inferior fibre, a reward was offered by the government of New Zealand in 1893 for the invention of a machine which would produce a satisfactory fibre. The fibre is becoming popular as a material for binder-twine on reaping machines.

PHORONIS, a marine animal of the class *Phoronidea*. It is worm-shape, with long slender body enclosed in a leathery tube. At the mouth is a circlet of tentacles. It abounds on the New England coasts and in Europe. They are also found on the shores of Australia. Consult Harmer, S. F., in ‘Cambridge Natural History’ (Vol. II, London 1899).

PHORORHACHOS, fŏ-rō-ră'kŏs, a huge fossil bird of the Miocene Age, several species of which are found in the rocks of eastern Patagonia. It was as large or larger than an ostrich, and is «remarkable for the immense size and heavy build of the skull, to which the legs, huge though they sometimes are, bear no proportion; the maxilla is exceedingly compressed, yet very deep, and ends in a strong hook, while the long massive mandible curves upward to meet it.» The bird must have resembled in appearance a great, thick-legged ostrich, with the head of a still greater hawk. Its relationships are in dispute, and it is not even certain that it is ratite, the sternum not having yet been disclosed. Evans, ‘Birds’ (1900), places it in the same group as the epiornis; while Dr. Gadow and others regard it as representing the ratite *Stereonithes*.

PHOSGENE, fōs'jēn or -jĕn, *in chemistry*, $COCl_2$, carbonyl chloride, phosgene gas, carbon oxychloride, was first obtained by Davy (1812) by direct union of carbon monoxide (CO) and chlorine in sunlight and is still made by same process. A colorless gas with suffocating odor and very disagreeable effect on respiratory organs; on cooling or under pressure it condenses to a low boiling liquid. A very active chemical agent, used in the manufacture of various chemical substances, particularly dye stuffs, it comes on the market as liquid under pressure in steel cylinders or in solution in toluene.

PHOSPHATE FERTILIZERS. See FERTILIZERS.

PHOSPHATE ROCK. See MINERAL PRODUCTION OF THE UNITED STATES.

PHOSPHATES. See PHOSPHORIC ACID.

PHOSPHINE. See PHOSPHORUS.

PHOSPHOR-BRONZE, an alloy made by fusing phosphor-tin with copper. It usually contains 0.053 to 0.76 phosphorus and 8 to 12 per cent of tin. The effect of the phosphorus is probably to reduce action on the oxides of the other metals during the process of manufacture. Phosphor-bronze is of finer grain and color than ordinary bronze. It is as tough as wrought iron, more ductile than copper, is completely homogeneous and shows great resistance to wear. Because of these qualities it is largely employed for bearings, wire and cannon. It was invented about 1870 by two Belgian metallurgists.

PHOSPHORESCENCE, a term formerly used to indicate a variety of phenomena consisting in the production of light without the concomitance of such a degree of heat as is associated with normal combustion. Besides the luminescence of living organisms (see PHOSPHORESCENCE IN LIVING ORGANISMS) these phenomena comprise thermoluminescence, or the luminescence of substances such as fluorspar below ordinary red heat (only after exposure to light however); triboluminescence or luminescence, such as that of sugar, due to cleavage, friction or similar mechanical means; crystalloluminescence, exhibited by arsenious acid, taking place during crystallization from fusion or solution; chemiluminescence, or the formation of light in a chemical reaction without corresponding heat, as in the case of phosphorus; electroluminescence, or luminescence excited by electrical means, which takes place in many gases upon the passage of an electrical discharge; and photoluminescence, or luminescence upon exposure to light. When photoluminescence lasts only so long as the light that causes it, it is known as fluorescence (q.v.), but if it remains after the inducing light has ceased, it is called phosphorescence in the strict sense current at the present time. This is shown by a large number of substances — perhaps the majority — in some slight degree, and is especially characteristic of the sulphides of the alkaline earths, if these are prepared artificially. It appears that this phosphorescence is partly due to the presence of minute, but definite, proportions of foreign substances. Solid flurorescent substances invariably manifest some degree of phosphorescence, but this is not exhibited by fluorescent liquids, unless these are rendered solid by freezing or gelatinization or some similar process. The color of the phosphorescence of a substance depends on a large number of imperfectly understood factors, but is almost invariably, if not quite, of longer wave-length than the stimulating rays. Phosphorescence may be caused by invisible light-rays, such as ultra-violet rays or X-rays. Cathode rays and the radiations from radium and allied substances will produce effects much like ordinary phosphorescence.

The duration of brief periods of phosphorescence is measured by instruments known as phosphoroscopes. These consist of a dark chamber in which is the substance to be examined. This has two openings, obstructed by shutters so arranged that the shutter at one end is open when that at the other end is closed and vice-versa. Light is admitted to the phosphorescent substance through one opening, and it is examined through the other. It is clear that by causing the alternating action of the shutters to take place with sufficient speed the briefest phosphorescence will appear to the observer like a continued glow, and that by comparing the intensity of this glow with the form and speed of the shutters the duration of phosphorescence can be measured. Consult Becquerel, 'La lumière' (Paris 1867); Winkelmann, 'Handbuch der Physik' (Vol. VI, Leipzig 1906).

PHOSPHORESCENCE IN LIVING ORGANISMS. Many living organisms, both in the animal and in the vegetable kingdom, exhibit an ability to give off light. This light is characterized by the almost perfect efficiency with which it is generated. As much as 97 per cent of the radiation from the phosphorescent organism lies within the bounds of the visible spectrum. This contrasts strongly with the efficiency of all other forms of illumination. The best artificial illumination has an efficiency of about 10 per cent, while the efficiency of the sun is not far from one-third. Phosphorescence is observed in the animal kingdom among Radiolarians; the pelagic Cystoflagellate *Noctiluca;* certain medusæ, polyps and Ctenophores; Rotifers; Chaetopod worms such as *Chætopterus;* some Polyzoa; *Pholas* and other Molluscs; Copepoda and deep-sea Crustacea; Myriapods; certain May-flies; Elaterid beetles of the genus *Pyrophorus;* the *Lampyridæ* or common fire-flies; Ascidians, and many deep-sea fishes. The phosphorescence of pelagic forms often causes the sea to appear a mass of light. In the vegetable kingdom certain bacteria and saprophytic fungi show a most marked phosphorescence and cause the fox-fire often seen on rotten stumps. Phosphorescence in most cases, if not in all, is due to the slow oxidization of some fat-like substance in the presence of water. In multicellular animals this oxidation usually takes place in the products secreted by certain glands on the integument. These glands are well innervated and sometimes the entire luminescent organ consists simply of a gland or glands, together with the nerves pertaining thereto. On the other hand, the luminescent organ, instead of being of this simple diffuse sort, may possess a high degree of organization. It may have a reflector, a lens and an iris diaphragm, as in the case of the organs of many deep-sea fishes. These are located in a variety of different positions, but there is a general tendency to group them on the head. They enable the fish to find its prey and to avoid its enemies in the dark abyss of the sea. Sometimes they may serve as bait, in cases where they are found on barbels dangling near the mouth. In other cases their chief purpose may be that of making recognition possible.

PHOSPHORIC ACID, *in chemistry,* an acid substance formed by the union of phosphorus pentoxide (see PHOSPHORUS) with the elements of water. The combination may occur in three proportions. When one molecule of the pentoxide combines with three molecules of water, the resulting acid is called «orthophosphoric acid»; when one molecule of the pentoxide combines with two molecules of water, the acid is called «pyrophosphoric acid»; and when one molecule of the pentoxide combines with one molecule of water, the acid is called «metaphosphoric acid.»

Orthophosphoric Acid.— This is the compound which is always understood, when «phosphoric acid» is mentioned without further qualification. It has the chemical formula H_3PO_4, and may be prepared, as indicated by the equation $P_2O_5 + 3H_2O = 2H_3PO_4$, by dissolving phosphorus pentoxide in water, and boiling the solution. This acid is also formed when phosphorus is heated with nitric acid, red fumes composed of the lower oxides of nitrogen being evolved, while the phosphorus is simultaneously oxidized, passing into solution in the form of phosphoric acid, H_3PO_4. Pure phosphoric acid (that is, orthophosphoric acid), when free from water, forms a thick, semi-solid mass, with a specific gravity of about 1.88, and it may be obtained in the form of tabular crystals, by evaporating the nearly anhydrous acid in a vacuum, over concentrated sulphuric acid. The crystals melt at 107° F., and the liquid formed from them solidifies again, when cooled to 100° F., the temperature at the same time spontaneously rising to 105° F. The crystalline and the syrupy forms both dissolve freely in water, and both deliquesce when exposed to the air. The phosphoric acids form salts, which are known as «phosphates.» Common, or orthophosphoric acid, is tribasic, each of its hydrogen atoms being replaceable by a monovalent base. With sodium, for example, it forms three definite, crystallizable compounds. Common neutral sodium phosphate, or «hydrogen di-sodium phosphate,» may be obtained in the form of large, transparent, rhombic prisms, by neutralizing phosphoric acid by sodium carbonate, and evaporating the solution. The crystals have the composition $HNa_2PO_4 + 12H_2O$. If sodium hydrate is added to a solution of this salt, needle-like crystals of sodium subphosphate, or «tri-sodium phosphate,» are obtained upon evaporation, these having the formula $Na_3PO_4 + 12H_2O$. If on the other hand excess of phosphoric acid be added to a solution of the common phosphate, evaporation yields crystals of sodium superphosphate, or «dihydrogen sodium phosphate,» $N_2NaPO_4 + H_2O$. An orthophosphate is known as «primary,» «secondary,» or «tertiary,» according, as one, two or three of the hydrogen atoms of the acid are replaced by a monovalent base. With calcium, orthophosphoric acid forms three well-defined compounds. The normal phosphate, $Ca_3(PO_4)_2$, occurs native as the mineral «phosphorite,» and also, combined with the fluoride or chloride of calcium, as «apatite.» It is likewise an essential constituent of bones, forming about 85 per cent of the weight of their ash. It may also be prepared, artificially, by adding phosphoric acid to a solution of calcium chloride, when it is obtained in the form of a white, amorphous powder. Calcium phosphate, in some form, is an essential constituent of fertile soil, as it is needed for the growth of plants. The normal phosphate, just described, is capable of furnishing both the phosphorus and the calcium; but since it is nearly insoluble, it is not readily absorbed by the plant. By the action of strong sulphuric acid, the normal phosphate, $Ca_3(PO_4)_2$, is converted into a soluble compound which has the formula $CaH_4(PO_4)_2$, as indicated by the equation $Ca_3(PO_4)_2 + 2H_2SO_4 = CaH_4(PO_4)_2 + 2CaSO_4$. The compound $CaH_4(PO_4)_2$ is known as «monocalcium phosphate,» or (commercially) as «superphosphate of lime,» and is prepared artificially on the large scale, from bones and the mineral phosphates of calcium, for use as a fertilizer, for which it is especially adapted by reason of its solubility. Commercial phosphoric acid is prepared chiefly from superphosphate of lime, but the process is a somewhat involved one, and for it the treatises on technological chemistry must be consulted. Pure phosphoric acid, for use in medicine and in the laboratory, is usually prepared by the oxidation of phosphorus, as described above. Dicalcium phosphate, $CaHPO_4$, may be prepared by precipitating a solution of calcium chloride with ordinary sodium phosphate, Na_2HPO_4. It is of far less importance than either of the other phosphates of calcium. Many other compounds of orthophosphoric acid with metallic bases are known, and many of these are used both in the laboratory, and in the arts. Numerous double salts are also known, in which the hydrogen of the acid is replaced partly by one base, and partly by another. Of these, the hydrogen-ammonium-sodium phosphate, or «microcosmic salt,» $HNaNH_4PO_4 + 4H_2O$, deserves special mention, since it is greatly used in the laboratory. It may be prepared by crystallization from a solution containing five parts by weight of crystals of common sodium phosphate, $Na_2HPO_4 + 12H_2O$, and two parts of secondary ammonium phosphate, $(NH_4)_2HPO_4$.

Pyrophosphoric Acid.— When concentrated orthophosphoric acid is heated to 415° F., until it yields, with silver nitrate, a white precipitate (instead of a yellow one), it becomes converted into a different compound, which is known as «pyrophosphoric acid,» has the formula $H_4P_2O_7$, and is tetrabasic. The change consists in the loss of a molecule of water, as may be seen by writing formulæ for orthophosphoric and pyrophosphoric acids in the respective forms: $2H_2PO_4 = P_2O_5 3H_2O$, and $H_4P_2O_7 = P_2O_5 2H_2O$. The salts of pyrophosphoric acid are much more important than the acid itself, and are known as «pyrophosphates.» They may be prepared most readily by the action of heat upon the secondary orthophosphates. Thus if common (that is, secondary) sodium phosphate, Na_2HPO_4, be heated to redness, it loses the elements of water, and becomes converted into normal sodium pyrophosphate, $Na_4P_2O_7$, as indicated by the equation $2Na_2HPO_4 = Na_4P_2O_7 + H_2O$. This salt can be dissolved in water and crystallized, for it does not readily take up water again, so as to be reconverted into the ordinary orthophosphate. The pyrophosphates are transformed into orthophosphates, however, upon being strongly heated with an alkali or an alkaline carbonate, and also when boiled in aqueous solution with the stronger acids. Several of the pyrophosphates, especially those of iron, are used in medicine.

Metaphosphoric Acid.— When phosphorous pentoxide, P_2O_5, is dissolved in cold water, it combines with one molecule of the water to form an acid which has the formula HPO_3; the equation being $P_2O_5 + H_2O = 2HPO_3$. The same compound may be obtained in the form of a glassy, ice-like mass, by heating anhydrous orthophosphoric acid to 750° F. The vitreous mass so obtained is known as «glacial phosphoric acid.» It dissolves in water to form a solution of metaphosphoric acid, and if the solution is allowed to stand for a time and is then boiled, it becomes converted into ordinary orthophosphoric acid. Metaphosphoric acid forms salts, which are known as «metaphosphates»; but these are of much less importance than the orthophosphates and pyrophosphates.

Phosphatic Fertilizers.—Apatite (q.v.) has been used to some extent as a fertilizer, but rock phosphate, in which the phosphoric acid has probably resulted from organic matter, constitutes the greatest source. It usually occurs as concretions or thin beds in sedimentary rock. Florida is the largest producer, the supply coming from rocks of Tertiary age. Phosphate of similar age occurs in South Carolina. The Tennessee beds occur in rocks of Ordovician and Devonian age. Large reserves, as yet practically untouched, exist in Carboniferous rocks in Utah, Idaho and Wyoming.

PHOSPHOROSCOPE, an apparatus consisting of glass tubes arranged in a box and containing phosphorescent substances, as the sulphides of lime, strontium, barium, etc. When this is exposed to the sun's rays or to the light emitted by a gas-burner or burning magnesium, and then removed to a dark place, each tube appears to glow with light of a different color, as red, blue, green, etc. Also an instrument devised by Becquerel for measuring the duration of phosphorescence in different substances.

PHOSPHOROUS ACID, a compound of phosphorus, oxygen and hydrogen, possessing acid properties, and having the chemical formula H_3PO_3. It may be prepared by acting upon phosphorus trichloride (see PHOSPHORUS) with water, as indicated by the equation $PCl_3 +$

$3H_2O = H_3PO_3 + 3HCl$. Hydrochloric acid, it will be seen, is formed at the same time; but this may be expelled by boiling. The solution, when concentrated by evaporation in a vacuum and allowed to cool, deposits crystals of phosphorous acid. These melt at about 160° F., and, when heated somewhat more strongly, decompose with the formation of phosphoric acid, H_3PO_4, and phosphine, PH_3. Phosphorous acid is dibasic, only two of its hydrogen atoms being replaceable by bases. It forms a series of salts known as «phosphites,» those of the alkali metals being soluble, while the others are mostly insoluble.

PHOSPHORUS (Greek, «light-bearer»), a non-metallic element, first prepared in the elementary form, about 1669, probably by Brand; although its discovery is also attributed to Boyle and to Kunkel. Phosphorus never occurs free in nature, but it forms an essential part of numerous minerals, prominent among which are apatite and phosphorite. It occurs in bones in considerable quantity, combined with lime, oxygen and organic matter; and the extensive beds of fossil bones that occur in the Carolinas and elsewhere are regularly worked for the sake of the calcium phosphate they contain. Phosphorus also exists in various organic substances, notably in brain tissue, in blood and in the yolks of eggs. Chemically phosphorus has the symbol P, and an atomic weight of 31.04, when that of oxygen is taken as 16.

Phosphorus was formerly prepared by reducing monocalcium phosphate by heating it with charcoal — the monocalcium phosphate being first obtained by the action of sulphuric acid upon tricalcium phosphate (or bone-ash). This process, which was cumbersome and expensive, has now been almost entirely replaced by the continuous electric-furnace process of Readman, Parker and Robinson. Bone-ash or phosphate rock can be used equally well as the source, and the furnace (which is of the vertical-electrode arc type) is charged with a mixture of one of these substances with charcoal and silica. The silica is added partly to increase the yield (because only two-thirds of the phosphorus is reduced by carbon alone) and partly to cause the slag to take a fluid form, so that it can be drawn off easily from the furnace, thus keeping the furnace clean. The products (in addition to the fusible slag) are phosphorus vapor and carbon monoxide, as indicated by the equation $Ca_3(PO_4)_2 + 3SiO_2 + 5C = 3CaSiO_3 + 2P + 5CO$. The yield of phosphorus, by this method, is said to be about two pounds per electrical horse power, per 24-hour day.

Phosphorus may be easily freed from sand, carbon and other solid particles by melting it under warm water and filtering it through canvas or chamois. It may also be purified by distillation from iron retorts.

Pure phosphorus, when prepared as described above, is a colorless, whitish or yellowish, semi-transparent, waxy solid, with a specific gravity of about 1.82, and a specific heat of about 0.19. It becomes brittle at low temperatures, melts at 110° F. under water and at 86° F. when dry, and distils, under ordinary atmospheric pressure, at 516° F. Melted phosphorus may often be cooled to a point considerably below its point of fusion before it again solidifies. It may be obtained in the form of crystals by fusing and cooling it in considerable quantities, or by subliming it in a vacuum, or by evaporating its solution in carbon disulphide. Phosphorus, in the form here described (which is called its «ordinary» form), is exceedingly inflammable. It should never be touched with the fingers, as it is liable to take fire from their warmth; and it should always be stored and manipulated under water.

When «ordinary» phosphorus is heated for some hours to about 500° F. in an atmosphere composed of some gas that will not combine with it, it becomes converted into an amorphous, red, allotropic modification, whose properties are quite different from those described above. Thus the red variety has a specific gravity of 2.25, is entirely insoluble in carbon disulphide, does not melt even when heated to redness in a sealed glass tube, and takes fire in the air only when heated to 500° F. Ordinary phosphorus glows in the dark when exposed to the air, the element taking its name from this circumstance. The red allotropic form, however, does not exhibit any such luminosity. Ordinary phosphorus is poisonous, and when handled in considerable quantities by persons with defective teeth, it often induces necrosis of the jaw-bone. Red phosphorus is pronounced, by nearly all authorities, to be non-poisonous; and if it has poisonous properties, they are certainly far less marked than those of the ordinary variety. Ordinary phosphorus is superficially converted into the red allotropic form by the action of light, its surface first becoming yellow, and then passing into a red. In the presence of a small quantity of iodine, the transformation of the ordinary form into the allotropic one is effected by heat with great facility.

Other allotropic varieties of phosphorus have been described, but their existence is not yet generally admitted. Hittorf, for example, dissolved phosphorus in melted lead, allowed the mass to cool, and then dissolved the lead in nitric acid. Violet-black crystals remained behind, which were composed chiefly of phosphorus; but they have never been obtained entirely free from lead and it is possible that their character is determined by the lead and other impurities present.

When phosphorus is heated in contact with air, it burns with a brilliant flame, and with the formation of clouds of «phosphorus pentoxide,» P_2O_5. These may be collected in the form of a white, amorphous powder, which absorbs moisture with avidity, and hence is used in the laboratory for drying gases. The pentoxide dissolves in water with a hissing noise, its solution constituting the compound known as phosphoric acid (q.v.). With hydrogen, phosphorus forms a gaseous compound known as phosphoreted hydrogen, or «phosphine.» This has the formula PH_3 and is best prepared by the action of caustic potash and water upon ordinary phosphorus; potassium hypophosphite, KPH_2O_2 being formed at the same time, in accordance with the equation $3KOH + 4P + 3H_2O = 3KPH_2O_2 + PH_3$. Phosphine is a colorless gas with an offensive odor suggestive of decomposing fish and it takes fire spontaneously upon contact with the air. The spontaneous inflammability appears to depend, however, upon the presence of traces of another hydride having the composition P_2H_4.

Chlorine combines directly with phosphorus, forming phosphorus trichloride, PCl_3, which is an oily liquid boiling at 169° F., and having a specific gravity of 1.61. The trichloride absorbs chlorine readily, forming a yellowish, solid pentachloride, PCl_5.

Phosphorus, on account of the facility with which it ignites under the influence of frictional heat, has long been used in the manufacture of matches and until recently the familiar «strike-anywhere» matches of our every-day experience had tips composed of ordinary phosphorus, combined with manganese dioxide, chalk, coloring matter and glue, or with other analogous substances. Necrosis of the jawbone (already mentioned above) was pitifully common, however, among the workers in match factories using the ordinary (or white) variety of phosphorus. Finland, in 1872, forbade the manufacture or sale of matches containing it, and similar action was subsequently taken in certain other countries. As a sequel to an international convention held in 1906, at which the match problem was considered, most of the leading nations agreed to discontinue the manufacture of the white-phosphorus match. England and the United States declined to enter the pact, but England reversed her decision shortly afterward, thereby leaving the United States the only important nation that still permitted the manufacture and use of matches of this kind and thrusting upon us the unenviable distinction of having phosphorus necrosis (or «phossy jaw»), known as a distinctively American occupational disease. This state of affairs was remedied by an act passed by Congress in April 1912, which taxed the white-phosphorus match out of existence and forbade the subsequent importation, exportation or sale of such matches; and with the enforcement of this act necrosis of the jaw, as an occupational disease, practically disappeared.

The «strike-anywhere» match that we now use depends for ignition upon the use of the sesquisulphide of phosphorus, which is practically non-poisonous. The sesquisulphide match was invented in France, and in 1912 the patent rights to it, in the United States, were owned by the Diamond Match Company. That corporation voluntarily surrendered them, however, and gave the sesquisulphide patents to the public without compensation and subject only to the condition that Congress would make the white phosphorus match illegal.

For the tips of «safety» matches, a mixture of potassium chlorate, potassium bichromate, antimony trisulphide and minium is often used. This will not ignite readily by ordinary friction, but takes fire easily when drawn across a surface coated with antimony pentasulphide and red phosphorus.

Phosphorus is used in considerable quantities as an essential constituent of various poisons for rats and other animal and insect pests. «Bologna phosphorus» does not contain any true phosphorus, but consists of calcined sulphide of barium (see Barium), taking its name from the marked phosphorescence that it exhibits after exposure to a bright light.

A. D. Risteen.

PHOSPHORUS, *in astronomy,* a name given the planet Venus as the morning star; also called Lucifer (q.v.). When it is an evening star it is known as Hesperus and Vesper.

PHOSPHORUS, Poisoning by. See Toxicology.

PHOTIUS, fō'shĭ-us, Byzantine scholar: b. Constantinople, 820; d. Armenia, 891. When he held the office of Secretary of State under the Emperor Michael III, the patriarch Ignatius incurred the displeasure of the weak and profligate Michael, was deposed, imprisoned and sent into exile and Photius was raised from the standing of a layman to the patriarchal dignity in his place. The installation was recognized by the metropolitans of the patriarchate, but opposed by Pope Nicholas I, whom Photius soon after excommunicated. But the Emperor Michael having been murdered in 867 by Basil, who was raised to the throne, that prince immediately replaced Ignatius in his office and banished Photius, who, however, resumed his dignity on the death of Ignatius in 878. On the accession of Leo, son of Basil, in 886, Photius was again deposed and banished to a monastery in Armenia, where he died. His death might have put an end to the division he had occasioned between the Greek and Latin churches, had not the popes refused to acknowledge the priests and bishops ordained by him and insisted upon their degradation. It is now difficult to arrive at a correct estimate of the character of Photius; for, while his biographers of the Roman Catholic Church ascribe to him craft, violence and perfidy, the Greek Church has canonized him. He was an able man of the world, but not influenced by the principles which befitted his sacred office; yet he was probably not below the average of the statesmen prelates of his age. His chief writings are (1) ‘Myriobiblion,’ an extensive review of ancient Greek literature by a scholar of erudition and judgment. The best edition is that of Bekker (1825). (2) ‘Nomocanon’ (q.v.). (3) A Greek Lexicon, of which editions have appeared at London (1822) and Leyden (1864–65). A collection of letters (Greek and Latin, London 1651). (5) A treatise on the Holy Spirit, maintaining the «Single Procession.» Consult Migne, ‘Patrologia Græca,’ Vol. 101–104 (1860); Hergenröther, ‘Photius, Patriarch von Konstantinopel’ (1867–73).

PHOTO-CHEMISTRY, that branch of chemistry which deals with the chemical changes that are produced by the agency of light. The earliest observed photo-chemical phenomena were the fading of dyes and other colors in a strong light and the bleaching of linen and similar fabrics, under the influence of sunlight. The oldest known example of the power of light to induce chemical change in an inorganic substance is undoubtedly the blackening of silver chloride — a phenomenon which has been familiar to chemists since the 16th century. The number of known photo-chemical phenomena is so great as to be almost past enumeration. The most important of them all is the decomposition of carbon dioxide gas by the green coloring matter («chlorophyll») that occurs in the leaves of plants; for it is by means of this decomposition that plants obtain the greater part of the carbon they subsequently utilize in the formation of wood and of starches and sugars and other analogous food-stuffs. The carbon dioxide gas that exists in the air is absorbed by the chlorophyll corpuscles in the leaves, and is split up, under the influence of sunlight, into carbon and oxygen. The oxygen is liberated in the free state (in large measure) and is permitted to escape again into the air. The carbon does not appear to be set free in the elementary state at any stage in the process, but is retained in the leaves in the form of some chemical combination with hydrogen and (probably) oxygen. The precise chemistry of the change is not definitely known; but as Sachs says, the «first *obvious* product» which is formed in the leaves is starch.

In the blackening of silver chloride there appears to be an elimination of chlorine, and, under ordinary circumstances, a simultaneous absorption of oxygen; the silver chloride ($AgCl$) being partially converted into an oxychloride, whose formula has been given as Ag_4OCl_2 by Hodgkinson, and as Ag_2ClO by Baker. Light acts in an analogous manner upon the other haloid salts of silver; but it appears that the decomposition can never proceed far, in any case, unless some substance is present which is capable of absorbing the liberated halogen. Moisture suffices as the absorbent in the case of the chloride and bromide of silver; but its sufficiency in the case of the iodide depends upon the way in which that salt is prepared. In photography, all three of these salts of silver are used, the chloride being employed in the preparation of positive prints, while the bromide and iodide are used in the manufacture of the negative plates. It is probable that an organic compound of silver is formed in the course of the manufacture of the emulsions employed in modern dry-plate photography, this organic compound being (as experience indicates) exceedingly sensitive to the action of light, becoming transformed with extraordinary facility into unstable compounds which are readily reducible by the subsequent action of the reducing agents that are technically known as «developers.»

It was formerly customary to consider sunlight as divisible into three essentially different kinds of rays, which were known, respectively, as «heat rays,» «light rays» and «actinic (or chemical) rays»; heat rays including those parts of the radiation which are distinguished by a relatively long wave-length, and which are mostly confined to the red and the infra-red parts of the solar spectrum; light rays including those parts which strongly affect the human eye; and actinic rays including those parts of the total radiation which are capable of effecting chemical changes and which were formerly considered to be mostly confined to the violet and ultra-violet parts of the spectrum. In modern physics this distinction has largely disappeared, especially with respect to the actinic rays; for while it is still admitted that chiefly the violet and ultra-violet rays are concerned in the reduction of silver salts, it is also recognized that many other chemical changes depend for their production upon rays of much greater wave-length. Many changes are known, for example, which are undoubtedly induced by the action of the red and infra-red rays, which have been ordinarily classified as «heat rays.» (Consult Tyndall, 'Contributions to Molecular Physics in the Domain of Radiant Heat').

The action of light upon a gaseous mixture composed of equal volumes of hydrogen and chlorine has been studied extensively, chiefly by Draper and by Bunsen and Roscoe. When a mixture of this kind is exposed to strong sunlight, its constituents combine explosively, with the formation of hydrochloric acid gas; but when exposed to a subdued light, they combine slowly and with considerable regularity. Draper invented an instrument (the «actinometer») for the measurement of the actinic power of a given source of light, basing its operation upon the rapidity with which combination takes place in a mixture of hydrogen and chlorine, when exposed to the light whose chemical power is to be determined. The instrument consisted of a bulb that was filled partially with water and partially with the mixed bases and which was also provided with a graduated capillary stem, in which a column of mercury or of water served as an index for the determination of any change of volume in the gaseous mixture in the bulb. When the bulb was exposed to a subdued light for a definite time, the hydrogen and chlorine combined partially and the hydrochloric acid gas that was formed was almost immediately absorbed by the water, in which it is exceedingly soluble. The volume of the gases in the bulb, therefore, suffered a reduction, which was proportional to the total amount of chemical change induced by the light; and the extent of this reduction in volume was indicated by the movement of the index-liquid in the graduated stem of the instrument. Draper's actinometer was open to two general objections. In the first place (as Draper himself discovered in 1843), the combination of hydrogen and chlorine, in a diffuse light, does not proceed at a rate that is strictly proportional to the time. The further researches of Bunsen and Roscoe showed that the action of the light, in Draper's actinometer, is at first very slow indeed and that the rate of combination increases, after the lapse of a certain time, up to a maximum value which is thereafter constantly maintained. In some of the experiments it was found that the chemical action during the seventh minute of exposure of the instrument was nearly as great as the total action during the first six minutes and that the action during the eighth minute was 50 per cent greater than that during the seventh minute. In these particular experiments the instrument could not be relied upon until after the lapse of eight minutes; and the initial period of irregularity would of course be different under other intensities of illumination. Great differences in the indication of the Draper instrument were also found to result from apparently trivial variations in the relative quantities of hydrogen and chlorine present. The second objection to the Draper actinometer is that it can indicate nothing but the power of the light under examination to induce the combination of hydrogen and chlorine, or to perform some other change that depends upon light of the same wave-length as that concerned in this particular effect. A similar objection may be urged, it is true, against every form of actinometer; for no instrument can be constructed, which will indicate anything about light of other wave-lengths than those that are concerned in its own operation. The point of the criticism is, however, that in estimating the power of a given light to perform a given kind of chemical change, it is essential that the actinometer adopted shall depend for its action upon the same wave-lengths as those concerned in the phenomenon for whose study the actinometer is employed. It is not logical, for example, to use the Draper actinometer for determining the power of a given light to effect the reduction of the halogen salts of silver, unless it is first proved that the combination of hydrogen and chlorine, and the blackening of silver salts, are effected by the action of light-rays of substantially equal wave-lengths. The commonest problem in actinometry at the present time is the determination of the time of exposure in the taking of photographic pictures; and when an actinometer is employed for this purpose, it usually consists of a strip of sensitive paper which is exposed until it darkens to a definite shade; the time required for this blackening being taken as an index of the intensity of the light, so far as its power of reducing silver salts is concerned. It is possible the initial slowness with which diffuse daylight induces the combination of hydrogen and chlorine is a characteristic common, to a greater or lesser extent, to all photographic processes; but familiar experience in the taking of so-called «instantaneous» photographs indicates that if this initial slowness exists in the case of the modern dry-plate, its period is exceedingly short. Consult Draper, 'Scientific Memoirs' (1878); Derr, 'Photography for Students' (1906); Plotnikov, 'Photochemie' (1910); Nernst, 'Theoretische Chemie' (1913). Compare ACTINOMETER; PHOSPHORESCENCE; PHOTOGRAPHY.

PHOTOENGRAVING, a general term covering various processes by which the action of light upon suitably sensitive surfaces is made to yield plates from which facsimiles of photographs or drawings may be printed. The processes commonly and very successfully employed at present are dependent upon the properties of various substances such as gelatine or similar bodies to undergo certain changes under the action of light.

If a thin layer of asphaltum is spread upon a metal plate and exposed to the light under a negative or positive, the parts under the clear portions of the screen either positive or negative become insoluble, while those under the dense parts remain soluble. When the plate is then washed with a suitable solvent, the soluble parts will be removed, the hardened parts remaining. The plate can then be etched, the asphaltum serving as an etching ground. The result is a relief plate, if the black parts of the design were hardened under a negative; an intaglio plate, if the whites were hardened under a positive.

Albumen, or white of egg, is soluble in cold water even if allowed to dry. If mixed with a solution of potassium bichromate and spread upon a surface and dried, it still remains soluble as long as it is not exposed to light. Albumen when combined with potassium bichromate acts like asphaltum, subject to certain modifications in handling.

If gelatine is mixed with potassium bichromate it retains its qualities if left in the dark, but exposed to light it acquires the power of resistance to mordants according to the degree of exposure. These peculiarities of the various substances mentioned have been used to further the work of the photo-mechanical processes. The aim of them all is to reproduce any photograph or drawing into a printing plate without the intervention of other than mechanical means.

The familiar half-tone, so generally employed in modern periodicals and books, is a very beautiful and successful result of the special application of the action of light upon a properly prepared copper plate. It is dependent for its printing qualities upon the interposition of the so-called half-tone screen between the object photographed and the negative. This screen is made up of pieces of glass that have been very finely ruled and put together in such a way as to make of the intersecting lines a great number of minute dots. The effect of this upon the negative is to break up the flat surfaces into a corresponding texture of dots, their size depending upon the relative darks and lights of the original. It is in fact a general stippling of the surface, affording a grain to which the ink may cling. The fineness or delicacy of the resulting plate is dependent upon the character of the screen used. In some of the most beautiful reproductions of to-day, there are as many as 200 dots to the inch. In such cases, however, successful printing is only possible with the very finest paper and the most experienced and careful press work. For ordinary magazine work the screen is usually 125 to 150 dots to the inch, while 100, 80 and 70-line screens are common for newspaper printing.

In making the half-tone a negative in reverse made with the screen is put into contact with a highly polished metal plate, usually copper, which has been properly sensitized or coated with a preparation of fish glue, bichromate of ammonia, albumen and water. It is then exposed to the light and afterward washed in water. Those parts which have been protected from the light by the denser portion of the negative are washed out and the other portions in varying degrees. The plate is then dried and burned in over a suitable heater, when it is ready for etching. Few half-tones are satisfactory without considerable artistic hand-work to perfect them. Much depends upon the skill of the photographer and upon the degree of etching.

The half-tone, more than any other of the photo-mechanical processes, has helped to advance and develop American illustrative art. Before its employment, drawings in wash or color had to be redrawn on the wood block in black and white and in reverse. This limited both the mediums employed and greatly hampered the comparatively few artists who had either the time or inclination to learn to draw in the special way required. With the advent of the half-tone, artists could draw as they chose; size was unimportant, for the photographic reproduction allowed for any reduction necessary. Again, there were artists whose work suffered materially at the hands of the engraver; the resulting print was only a fair interpretation, not a facsimile in black and white. The relative small cost of the half-tone has permitted of the freer use of illustrations, and has brought out the work of many men who have attained high places in American art. There have been many claimants for the invention of the half-tone, but it is generally conceded that Ives of Philadelphia was one of the first to make it practicable.

Frederick E. Ives invented the first successful half-tone process and half-tone three-color printing in 1878, when he had charge of the photographic laboratory at Cornell University. The half-tone process was simplified in operation in 1880, introduced commercially in Philadelphia in February 1881, and patents issued in the same year. This was a photo-mechanical process, the translation of the body shades of the photograph into definite line and dot, as required for typographic printing, depending upon the relation of ruled V-shaped lines to the uneven surface of a photogelatine relief.

The half-tone process now universally employed was the result of Mr. Ives' effort in 1885 to obtain the results more directly and economically, by substituting the application of an optical V line to a camera image for the application of the ruled V line to the photogelatine relief. The crossline sealed screen and the regulation of the gradation of line and dot by screen distance and special lens diaphragms was a part of the invention as operated by Ives in 1886, and afterward taught to others, but not patented.

The Meisenbach process, patented in 1882, was the first screen process to be used in a large way. The half-tone is most valued for the reproduction of photographs or drawings in which there are tints and masses involving delicate gradations.

For the reproduction of drawings in line or solids, the zinc etching process is employed, being less costly and more rapid. In this work the metal employed is usually a zinc plate coated with albumen mixed with bichromate and exposed under a reversed black and white negative made from the drawing to be reproduced. After exposure it is washed with a solvent that removes the unchanged part of the coating, leaving the lines of the design in hardened albumen upon the plate. It is then etched into relief and the rough places gone over with a graver and the blank spaces or pure whites routed out. It is then mounted on a block type-high and is ready to print.

Another familiar process employed in the reproduction of line work is known as the swell gelatine process. A bichromatized gelatine film is laid on a glass plate and exposed under a black and white negative. The film is then soaked in water, which causes the lines protected by the dark parts of the negative to swell up while the others do not swell. The film is then a mold or matrix from which a wax or plaster impression may be taken, and from this an electrotype can be made. This is a more difficult and uncertain process, however, and is not very generally employed.

Another most beautiful process involving just the reverse of the methods employed in the half-tone is known as photogravure. It may be employed either in the reproduction of drawings, in tint or pure line, and because of the absence of sharp lines and dots there results a fascinating richness of texture, a velvety quality that is especially adapted for the reproduction of paintings or old etchings. Some of the most sumptuous and valuable art works of our time are illustrated by the use of the photogravure, and it is constantly employed in the reproduction of drawings and prints of the old masters. One of the simpler methods of producing a photogravure plate is as follows: A copper-plate covered with asphaltum or albumen mixed with a bichromate is exposed under a black and white positive. The parts under the clear spaces of the positive are hardened; those under the opaque places corresponding to the lines of the original remain soluble. Washing with a solvent bares the metal in the soluble places, and the plate is then etched, the hardened coating forming a resist. A grain is obtained in this process by first sprinkling the plate with powdered resin which is made to adhere by heating. Photo-aquatint is another familiar method for the reproduction of intaglio half-tone plates. There are a number of processes known under various names that are somewhat similar in general character and involve adaptations in the use of sensitized gelatine. Among these the best known are the Woodburytype, the stannotype, the heliotype, the collotype and the autotype.

With the advent of color in the pages of our leading magazines, a new impetus has been given toward the development of methods by which direct reproductions can be made of colored originals. The so-called three-color process is based upon the theory that all the colors in the chromatic scale may be derived from the three primaries, red, blue and yellow. In making the half-tone negatives from a colored original, ray filters are used, which are transparent color mediums that permit only certain rays to be effective in the photographic plate. The resulting plates printed the one upon the other in just the proper shades of red, blue and yellow, ought to result, theoretically, in an exact copy of the original. As a matter of fact these color reproductions are but approximate. However, with the aid of a keyplate, printed in black or photo-brown, and by ingenious mechanical aids, the three-color or four-color work has been brought to a marvelous degree of perfection, and is generally employed for magazine covers and colored inserts.

In all of the various processes employed in photo-engraving, much has to be left to the skill of the operator. Certainly we owe much to the men who have done their part toward furthering the advancement of the mechanical processes. While the general principles and processes employed in these reproductive arts are well known and common property, there are yet many special adaptations and more or less secret methods that have grown out of special experimentation and experience.

Modern art has been brought into the household by our illustrative magazines and papers, and the art of all time can be studied in the cheap reproductions made possible by these modern photographic processes. For the photolithographic process see PHOTO LITHOGRAPHY.

J. B. CARRINGTON,
Assistant Editor 'Scribner's Magazine.'

The photo-engraving industry in the United States in 1914 included 376 establishments, employing 6,211 people, besides 1,771 employed in this work in connection with printing offices. The total production of both was $17,559,000.

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